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Measurement of Carcinogenic Vapors in Ambient Atmospheres

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MEASUREMENT
OF CARCINOGENIC VAPORS
IN AMBIENT ATMOSPHERES
Final Report

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Program Report



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MEASUREMENT OF CARCINOGENIC VAPORS IN AMBIENT ATMOSPHERES

Final Report

by

Edo D. Pellizzari
Research Triangle Institute
Post Office Box 12194
Research Triangle Park, North Carolina 27709

Contract No. 68-02-1228

Project Officer

Eugene Sawicki
Atmospheric Chemistry and Physics Division
Environmental Sciences Research Laboratory
Research Triangle Park, North Carolina 27711

ENVIRONMENTAL SCIENCES RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U. S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

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ABSTRACT

Analytical methods and instrumentation were evaluated for collecting and analyzing carcinogenic and mutagenic vapors occurring in ambient air. The areas of investigation included (a) the evaluation of Tenax GC sorbent for in situ reactions that may occur during the collection of organic vapors from ambient air; (b) the development and evaluation of a permeation system for delivering precise quantities of organic vapors for calibrating instruments; and (c) the characterization and quantification of hazardous organic vapors in ambient air collected at several different geographical areas within the Continental U.S.

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SECTION 1

INTRODUCTION

This research program on the development of analytical techniques for measuring carcinogenic ambient atmospheric vapors has attempted to furnish a comprehensive and systematic approach to this problem. It has attempted to develop and evaluate the sampling device, field collection methodology, and the entire procedure of the data analysis of carcinogenic vapors in the atmosphere. Until this research program was initiated, the ability to collect from the atmosphere and analyze a wide variety of chemical classes which contained toxic and/or carcinogenic organic compounds did not exist. For this reason, research programs to determine and evaluate the health-impact of carcinogenic compounds in the environment had not been conducted. Comprehensive studies on the levels of carcinogenic agents in all media in addition to air and the correlation of this exposure to body burden and health effects on man could also not be executed. Thus, a well-defined epidemiological approach which is required in this type of study to establish whether an associational relationship existed has in the past suffered from the lack of appropriate technology in order to achieve these goals.

The main reasons for identifying and determining environmental carcinogenic organics even at low concentrations are as follows:

- (1) A knowledge of the presence and concentrations of mutagens and carcinogens in the air is mandatory for a better understanding of genetic diseases and future carcinogenic and mutagenic problems which may arise after a long induction period.
- (2) If the incidence of cancer in the US is to be understood and controlled, it will be necessary to determine the concentrations of environmental carcinogens. It is necessary also to understand the complete organic composition of the atmosphere since there are antagonistic and synergistic relationships, i.e., anti- and co-carcinogenic factors which may occur and contribute to the observed incidence of cancer.

- (3) It is known that higher cancer mortality rates have been shown to occur near various sources of air pollution and in statistical studies, and it has been demonstrated that cancer associated with the respiratory system is higher where high air pollution occurs.
- (4) Recent estimates indicate that chemical synthesis adds some quarter of a million new chemical compounds each year to the several million already in existence. These new compounds can be a serious source of air pollution and may have a significant effect on the health of the human populace.
- and (5) The development of an analytical technique for measuring carcinogenic ambient vapors must provide a thorough analytical approach which will measure a wide number of potential environmental carcinogens and mutagens as well as their precursors and various co-factors and anti-factors.

The development of analytical techniques for measuring carcinogenic ambient atmospheric vapors has attempted to provide a conceptual approach which will allow the answering of questions cited above in subsequent research programs.

SECTION 2

CONCLUSIONS

A series of laboratory experiments was conducted to determine whether air containing both NO_x and ozone might be more effective in converting dimethylamine (DMA) to N-nitrosodimethylamine (DMN) than air containing only NO_x . Experiments were designed to delineate the conversion of DMA whether adsorbed on Tenax or at a low concentrations in air by atmospheric reactions or heterogeneous reactions which may take place on the walls of the sampler inlet tube. The extent of in situ reactions on the Tenax GC sorbent was specifically studied. The results of the study show that it is important to obtain simultaneous data on atmospheric concentrations of NO_x , ozone, and amines when sampling for nitrosoamines. A control such as the addition of $^2\text{H}_6$ -DMA to the sampling stream should be used to determine those environmental factors which may contribute to in situ DMN formation. This would be especially necessary in an attempt to show that nitrosoamines had been formed in the atmosphere from reactants. Under typical concentrations of NO_x , ozone and humidity observed in the ambient air, the in situ formation of DMN was generally <0.3% on the Tenax GC sorbent.

The previously reported permeation flow system was modified to incorporate improvements which provide a higher accuracy and reproducibility during the delivery of known concentrations of air/vapor mixtures to cartridges for the purpose of calibrating instruments. The best method of delivery of carrier gas to the permeation tube flow system was to control the pressure in the chamber with a low pressure regulator and to control the flow rates only with a valve which was used to split the flow. Increasing the pressure from 2-6" of water minimized signal fluctuation due to differences in flow resistance of individual cartridges in-line with the permeation system.

An examination of long-term performance of permeation tubes was also conducted. The effect of cold storage (0°C) indicated that upon return of the permeation tube to a constant temperature (20.1°C) permeation rates were

re-established in a relatively short period of time (48 hrs). It was generally concluded that for vapors of halogenated hydrocarbons, the plastics FEP and PFE were inadequate for obtaining a stabilized permeation rate after several weeks. Increasing the temperature to 30.4°C did not significantly increase the stabilization rate of permeation from these tubes. Preliminary studies indicate that polyethylene may be suitable for halogenated compounds.

A number of ambient air samples were collected from several geographical areas (Houston, TX and vicinity; Baton Rouge, LA and vicinity; and Edison, NJ) and characterized for hazardous organic vapors and gases. Many halogen-, sulfur-, oxygen- and nitrogen-containing compounds were identified. Alkanes, alkenes and alkyl aromatics were ubiquitous in these samples and were probably derived primarily from fossil fuel burning. Several hundred aliphatics and aromatics (including benzene) were identified. Over fifty halogenated organics were detected and quantified. Among these were vinyl chloride, vinylidene chloride, ethylene dibromide, several chloro ethers, and perchloroalkanes and chlorinated aromatics. Other heteroatom-containing organics (7 sulfur, 14 nitrogen and 90 oxygen) were identified, some of which were associated with specific geographical areas.

SECTION 3

RECOMMENDATIONS

Six major phases of research should be expanded and pursued:

- (1) the sampling cartridge should be further examined for potential in situ reactions which might occur during field sampling. This activity should delineate any problems associated with the sampling of atmospheres containing molecular chlorine, bromine or iodine in combination with olefins and NO_x , SO_2 and ozone. Other potential in situ reactions on the sorbent bed should also be examined, such as the ozonization of olefins by moderate to high atmospheric concentrations of ozone.
- (2) The examination of alternate new sorbent materials as a backup or substitute for Tenax GC should be pursued. This may involve the synthesis of analogs or a modified polymer base of Tenax in order to incorporate the desired retention volume properties for organics without increasing the overall background contribution and retention of inorganic gases and water.
- (3) Further development of capillary technology is recommended. New techniques for the modification of the glass capillary wall to minimize adsorption properties of the semi-polar and polar constituents should be developed. Techniques which circumvent the use of silanization should be pursued. An overall improvement in resolution and column capacity is recommended in order to improve the quantification of complex air mixtures.
- (4) Extensive sampling of numerous sites for hazardous atmospheric pollutants should be conducted. The methodology for collection, resolution, and identification of hazardous vapors in ambient air which was developed during the past four years under Contract No. 68-02-1228 should be applied to field sampling of numerous sites within the Continental U.S. with a major thrust toward the

characterization and identification of carcinogenic and mutagenic vapors. The selection of sites should be based on the high incidence of cancer in these areas, the types of industrial activity or the unique photochemical atmospheric reactions which take place. The selection of sites should include a wide variety of meteorological conditions in order to evaluate the overall techniques.

- (5) Identification and quantification of hazardous vapors in atmospheric samples should be performed. The hazardous vapors identified should be quantified in ambient air samples and the technique should be evaluated as to its accuracy and reproducibility for monitoring organic vapors in ambient air.
- And (6) Pollution profiles indicative of individual sites should be developed. Pollution profiles should be assembled for the various geographical areas postulated to contain hazardous vapors. These profiles should indicate site-specific pollutants and those vapors which are ubiquitous.

SECTION 4

PROGRAM OBJECTIVES

The general aim of this research program has been to develop, perfect and validate methodology for the reliable and accurate collection and analysis of mutagenic and carcinogenic vapors (hazardous compounds) present in trace quantities in the atmosphere (ng/m^3). This information is necessary in order to determine the physiologically active vapors which may be present in polluted atmospheres so that researchers can ascertain their biological impact on populated areas and their overall relationship to the incidence of cancer. The major program objectives were: (1) to evaluate the Tenax GC sorbent for in situ reactions occurring between secondary amines, NO_x , ozone and humidity; (2) to develop and perfect the performance of a permeation system for synthesizing air/organic vapor mixtures for calibrating instruments used for the quantification of hazardous vapors in ambient air; and (3) the identification and quantification of hazardous organic vapors in ambient air from several geographical areas within the Continental U.S. The latter objective was coupled with the information obtained for hazardous vapors, the validation of the polypollutant method which had previously been developed, and the gathering of information on the quantity of hazardous vapors for evaluating the incidence of cancer in the future.

SECTION 5

EVALUATION OF TENAX GC SORBENT FOR IN SITU REACTIONS

The detection and unequivocal identification of N-nitrosodimethylamine (DMN) and its quantification in the ambient air of Baltimore, MD, has recently been reported.⁽¹⁻³⁾ Ambient air was sampled using Tenax GC cartridge technique⁽⁴⁻⁹⁾ and sample analysis employed glass capillary gas chromatography/mass spectrometry/computer (glc/ms/comp) methods. N-Nitrosodimethylamine was also identified and quantified in ambient air in Belle, WV.⁽⁴⁾ However, it and N-nitrosodiethylamine (DEN) were not present in significant amounts in the atmosphere containing NO_x , ozone, dimethylamine (DMA) and diethylamine (DEA) of South Charleston, WV.⁽⁴⁾

In view of the potency and the broad spectrum of carcinogenic activity of DMN in experimental animals,⁽¹⁰⁾ the detection of DMN in the atmosphere had generated considerable interest in its origin. Studies were initiated to determine its emission from stationary and fugitive sources as well as its photochemical production⁽¹¹⁾ from precursors (NO_x , DMA).

In order to determine whether DMN may form in an atmospheric chemical reaction it is first necessary to know the extent to which it may form at trace levels as an "artifact" of the technique employed or the sample collection process. Furthermore, the experimental methods should differentiate between homogeneous and heterogeneous reaction mechanisms.

Our primary concern has been with the use of the Tenax GC sampling cartridge which has been extensively employed for collecting organic vapors from ambient air for characterization and quantification purposes. Since the Tenax GC cartridge would concentrate DMA if present in ambient air, it was conceivable that, in the presence of NO_x , DMA might be nitrosated to form DMN, even though inorganic gases do not appreciably accumulate on the sorbent.⁽³⁾ It was the purpose of the present study to further supplement the previously reported observations^(3,4) as to whether an in situ reaction could occur on the Tenax GC sampling cartridge.

Since urban air often contains substantial concentrations of ozone, we also conducted a series of laboratory experiments to determine whether air containing both NO_x and ozone might be more effective in converting DMA to DMN than air containing only NO_x . Experiments were designed to delineate the conversion of DMA whether adsorbed on Tenax GC or at low concentrations in air by atmospheric reaction(s) or heterogeneous reactions which might take place on the walls of the sample inlet tube.

EXPERIMENTAL

The apparatus used to determine whether air containing O_3 , NO (Matheson, Coleman, Bell), NO_2 (Matheson, Coleman, Bell), $^1\text{H}_6$ -DMA (Linde Division, Union Carbide Corp.), $^2\text{H}_6$ -DMA (Merck, Sharpe, Dohme) and water might convert DMA to DMN on Tenax GC (35/60 mesh, Applied Science, State College, PA) is depicted in Figure 1. Nitric oxide was measured into the stream with a rotometer and a metering valve from a supply tank which contained 54.2 ppm of NO in nitrogen (Scott Environmental). Ozone was generated by an ultra-violet lamp equipped with a sliding cover for obtaining different concentrations and with the aid of a Welsbach ozone generator for concentrations >1 ppm. Concentrations of NO, NO_2 , and O_3 were monitored with a Bendix NO_x analyzer (Model 5513802) and a Bendix Ozone analyzer. Intakes for these instruments were at the same point as the intake for the Tenax GC glass cartridge sampler (1.5 cm i.d. x 6.0 cm bed length) through which air was drawn by a Nutech Model 221-A (Nutech Corp., Durham, N.C.) sampler. The sampling cartridge and analyzer inlet tubes were centered in the air flow pattern of the reaction tube. Various relative humidities in the air stream were produced by changing the temperature of the humidifier bath.

The $^1\text{H}_6$ -DMA and $^2\text{H}_6$ -DMA were purified prior to use by low temperature vacuum distillation using a double bulb technique since $^1\text{H}_6$ -DMA had been found to contain 10 ppm of DMN by gc/ms/comp analysis. Polyethylene permeation tubes of $^1\text{H}_6$ -DMA and $^2\text{H}_6$ -DMA were prepared and gravimetrically calibrated with a MS-5A Mettler balance after their equilibration to constant rates.

Prior to its use Tenax GC was purified by Soxhlet extraction for 18 hours each with acetone and *n*-hexane, respectively. After drying under a nitrogen atmosphere, Tenax GC was heated to 100°C for 2 hr in a vacuum oven (12 in H_2O), meshed into a 35/60 range and packed into glass tubes. All

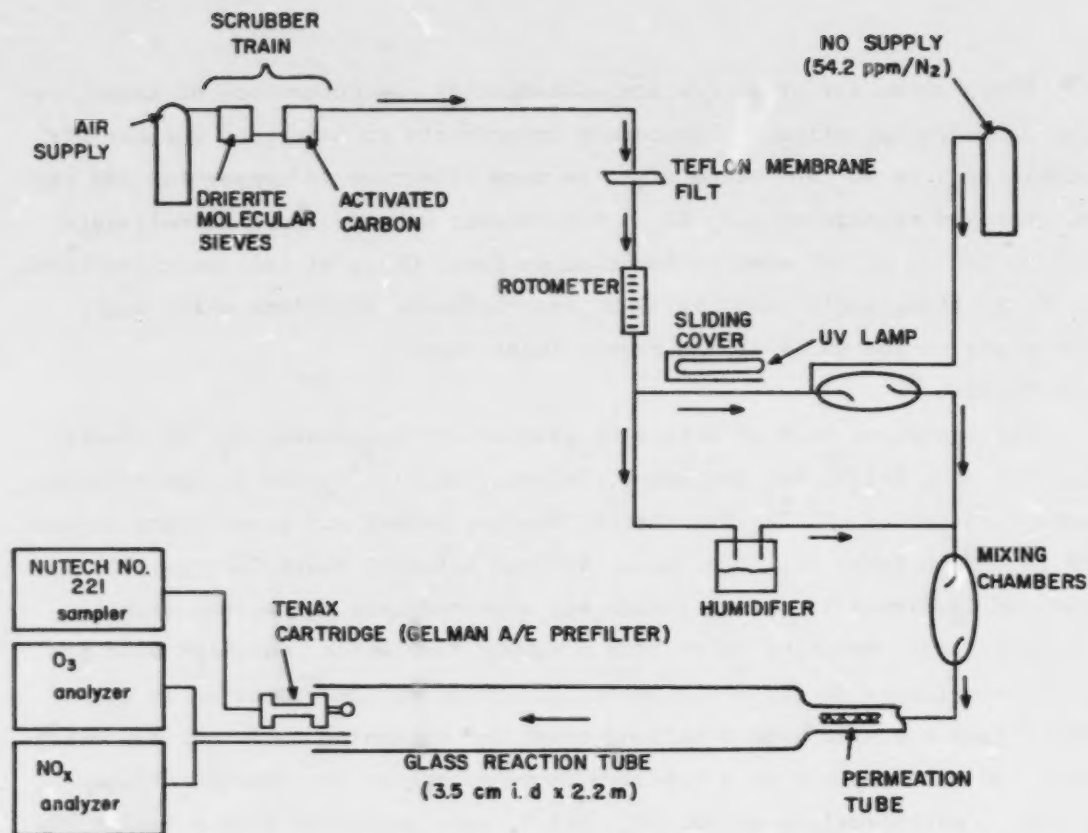


Figure 1. Schematic of instrumentation and devices for examining in situ formation of N-nitrosodimethylamine on Tenax GC cartridges.

sampling cartridges were preconditioned by heating to 275°C for 20 min under a He purge of 20-30 ml/min. After cooling in precleaned Kimax® culture tubes, the containers were sealed to prevent contamination of the cartridge.

Replicate samples and blanks were analyzed by glass capillary gc/ms/comp. Thermal desorption was used to transfer vapors from the cartridge sampler to the analytical system using a specially designed manifold.⁽⁵⁻⁷⁾ In a typical thermal desorption cycle, a sampling cartridge was placed in the desorption chamber (250°C) and He gas was passed through the cartridge (ca. 20 ml/min) to purge the vapors into the liquid nitrogen cooled nickel capillary trap. After desorption (4 min), the six-port valve was rotated and the temperature on the capillary loop was rapidly raised (>10°C/min); the carrier gas introduced the vapors onto the capillary glc column.

A Varian MAT CH-7 glc/ms 620L computer system equipped with the inlet manifold was used for analyzing Tenax GC cartridges. The software provided reconstructed gas chromatograms and mass fragmentograms for a correlation between mass spectrum number and retention time. Operating parameters for the glc/ms/comp system are given in Table 1. A single stage glass jet separator interfaced the SCOT capillaries to the mass spectrometer.

The parent ions for $^1\text{H}_6$ -DMN (m/e 74, I=100%) and $^2\text{H}_6$ -DMN (m/e 80, I=100%) were selected for quantification (Fig. 2). Standard response curves for DMN were prepared by loading Tenax GC cartridges with concentrations of DMN from 100 pg to 2,000 ng followed by thermal desorption and analysis by glc/ms/comp.

RESULTS AND DISCUSSION

Laboratory experiments were conducted whereby Tenax GC cartridges (1.5 cm x 6.0 cm) were preloaded with dimethylamine (DMA) by passing through them nitrogen gas which contained a known quantity of DMA from a calibrated permeation tube ($^1\text{H}_6$ -DMA or $^2\text{H}_6$ -DMA). Each of these cartridges was used to sample a 10 liter volume of air containing known levels of NO, NO₂, O₃, and water. Then the cartridges were thermally desorbed and analyzed for $^1\text{H}_6$ -DMN or $^2\text{H}_6$ -DMN. The results are summarized in Table 2. One cartridge, preloaded (in absence of reactive gases) with $^2\text{H}_6$ -DMA was submitted for gc/ms analysis (m/e 80) without further processing to determine the level of $^2\text{H}_6$ -DMN present in the amine as a contaminant (Expt. No. 1). No $^2\text{H}_6$ -DMN was found. Four experiments (Nos. 5-8) were run in which air with ~300 ppb NO

Table 1. OPERATING PARAMETERS FOR GLC/MS COMPUTER SYSTEM

Parameter	Setting
Inlet-manifold	
Desorption chamber	265-270°C
Valve	175°C
Capillary trap - minimum	-196°C
maximum	+175°C
Thermal desorption time	~4 min
Gas-liquid Chromatography	
DEGS glass SCOT (55 m)	70-205°C, 4°C/min
Carrier (He)	2.25 ml/min
Mass Spectrometry	
Single stage glass jet separator	220°C
Ion source vacuum	$\sim 2 \times 10^{-6}$ Torr
Filament current	300 μA
Multiplier	5.5
Scan rate, automatic-cyclic	1 s/decade
Scan range	m/e 20 → 300

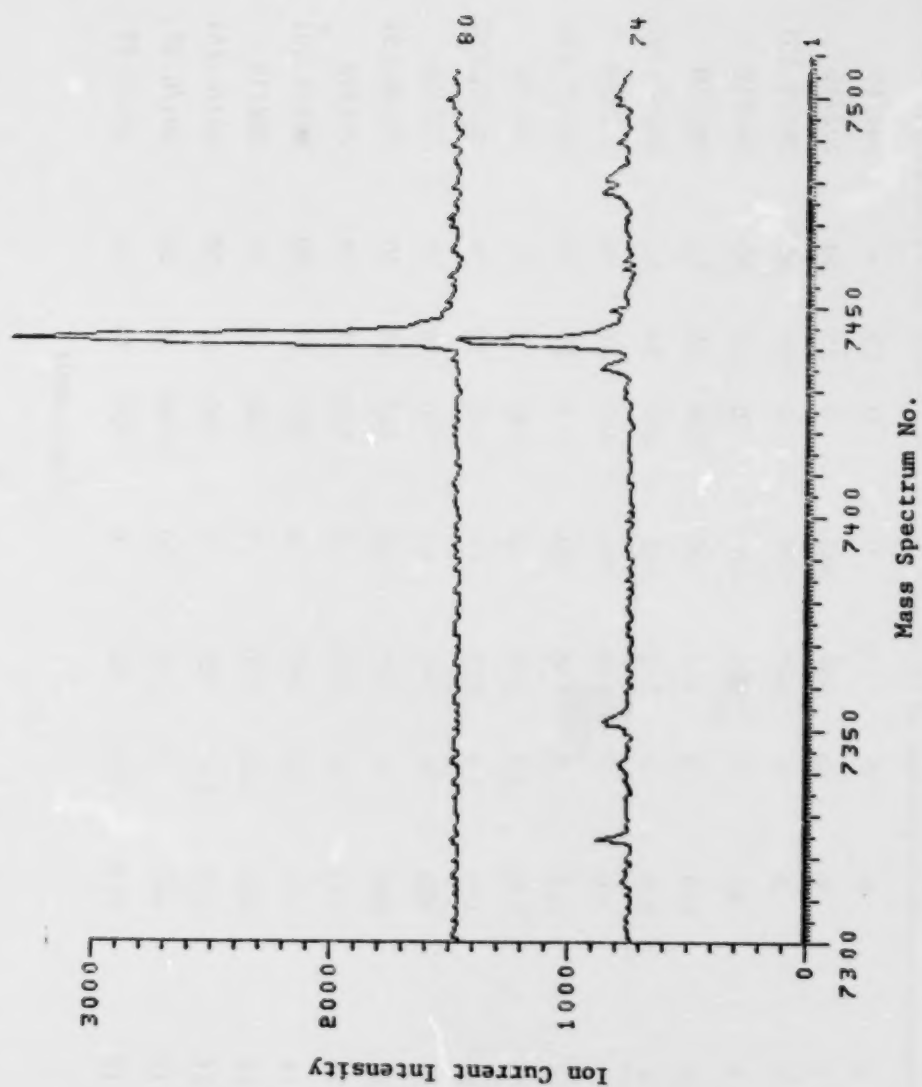


Figure 2. Mass fragmentograms for $^1\text{H}_6\text{-DMN}$ (m/e 74) and $^2\text{H}_6\text{-DMN}$ (m/e 80) obtained by glc/ms/comp (see Expt. No. 36, Table 3).

Table 2. EFFECT OF OZONE, NO, NO₂ AND DMA ON IN SITU FORMATION OF DMN

Experiment No. a	O ₃ added (ppb)	O ₃ excess (ppb)	NO _x (ppb)	NO (ppb)	NO ₂ (ppb)	T°C	%RH	DMA (nM)/(liters)	DMN (nM)	% yield
1	0	0	0	0	0	25	-	202/10	0	0
2	0	0	500	500	0	25	50	202/10	0	0
3	0	0	500	500	0	25	90	202/0.151	0	0
4	80	0	500	420	80	25	50	202/10	0.18	0.089
5	200	0	500	300	200	25	50	202/10	0.32	0.158
6	200	0	510	310	200	24	67	202/0.151	0.14	0.069
7	210	0	490	280	210	27	10	202/10	0.12	0.059
8	210	0	530	320	210	27	10	202/0.151	0.65	0.322
9	510	10	530	30	500	25	50	202/10	0.54	0.267
10	479	9	515	45	470	26	90	202/0.151	0.92	0.455
11	550	50	540	40	500	26	10	202/10	0.12	0.059
12	489	9	520	40	480	27	10	202/0.151	1.46	0.723
13	650	150	500	0	500	26	50	202/10	0.86	0.426
14	640	140	500	0	500	27	90	202/0.151	1.24	0.614
15	650	150	500	0	500	26	10	202/10	0.93	0.460
16	640	140	500	0	500	27	10	202/0.151	1.46	0.723
17	482	2	540	60	480	24	50	404/0.42	0.58	0.144
18	680	180	500	0	500	24	50	404/0.42	0.25	0.062

(continued)

Table 2 (cont'd)

Experiment No.	O ₃ added (ppb)	O ₃ excess (ppb)	NO _x (ppb)	NO (ppb)	NO ₂ (ppb)	T°C	%RH	DMA (nM)/liters	DMN (nM)	% yield
19	~1500	~1000	500	0	500	26	50	202/0.215	2.78	1.376
20	~2500	~500	~2000	0	~2000	26	50	202/0.215	1.16	0.574
21	~3000	~1000	~2000	0	~2000	26	50	202/0.215	1.04	0.515

^aIn all experiments a 1 l/min sampling rate for 30 min was used.

and ~200 ppb NO_2 was sampled. Two of these (Nos. 7 & 8) were run with low humidity air. In two cases (Nos. 6 & 8) a very small volume of nitrogen was used to preload the $^2\text{H}_6$ -DMA so that it would be confined to a relatively narrow zone in the cartridge bed. In the other two cases (Nos. 5 & 7) a 10 liter volume of nitrogen was used to preload the $^2\text{H}_6$ -DMA so that it was distributed in a much broader zone in the sorbent bed. The amounts of $^2\text{H}_6$ -DMN formed did not fall into any definite pattern. Except for Experiment No. 8 they are about the same as the amount formed in Experiment No. 4. The amount of ozone added to the air stream was increased so that most of the NO was converted to NO_2 leaving small residual amounts of NO and ozone (Nos. 9-12). This resulted in formation of increased quantities of $^2\text{H}_6$ -DMN in three of the experiments. More $^2\text{H}_6$ -DMN was formed on the cartridges which had been loaded with $^2\text{H}_6$ -DMN confined as a small narrow zone (Nos. 10 & 12) than was formed on cartridges loaded with the same amount of $^2\text{H}_6$ -DMA in a larger zone (Nos. 9 & 11). The ozone was further increased so that there was a substantial excess of it at the end of the flow tube and all of the NO was converted to NO_2 (Nos. 13-16). Again, the amount of $^2\text{H}_6$ -DMN produced was generally larger and more was produced on the cartridges which were loaded with concentrated zones of $^2\text{H}_6$ -DMA (Nos. 14 & 16). Doubling the amount of $^2\text{H}_6$ -DMA on the cartridge did not result in any increase in the amount of $^2\text{H}_6$ -DMN formed (Nos. 17 & 18). It was expected that a high concentration of DMA in a small volume of sorbent bed would produce more DMN than the same amount of DMA distributed evenly through the entire bed.

There was no clear indication that the level of relative humidity had any significant effect on the results. This was not surprising in view of the very large excess of water over the concentrations of other potential reactants at even the lowest levels of relative humidity. A constant, convenient level of 50% relative humidity was adopted for further experiments.

The concentrations of NO_x and ozone in these experiments were at levels approximating the highest found in polluted air. In order to test the possible effects of conditions that might prevail at extremely elevated levels of NO_x in plumes coming from a point source, three experiments (Nos. 19-21) were conducted at much higher NO_x and ozone concentrations. There was a substantial increase in the amount of DMN formed when the ozone level was

increased (No. 19), but no indication of any increase from higher levels of NO_2 (Nos. 21 & 21).

The principal result of this series of experiments is that under extreme conditions of NO_2 and ozone pollution the conversion of 202 nM of DMA on a Tenax cartridge was small (less than 1%). However it must be remembered that the breakthrough volumes of DMA were not exceeded in these experiments. Furthermore, the breakthrough volume of DMN is much larger than that of DMA. If a volume of polluted air larger than the breakthrough volume of DMA had passed through the cartridge, presumably even more of the DMA would have been converted, and the resulting DMN would have been retained on the cartridge. Thus it would be misleading to attempt to extrapolate these results to higher sample volumes. On the otherhand, the concentrations of DMA used to load the cartridges (0.5-33 ppm) were quite large, approximating the levels that could be found in ambient air in the immediate vicinity of a primary source. The results of this study suggest that the efficiency of conversion of DMA to DMN would be greatly dependent on the concentration of DMA in the sorbent bed. This means that more DMN might be formed on the cartridge if the DMA concentration fluctuated during the sampling period than if the same amount of DMA were drawn into the cartridge at a constant, low concentration.

The presence of NO_2 was clearly necessary for formation of DMN. This suggests that the mechanism was formation of nitrous acid from NO, NO_2 and water with subsequent reaction between nitrous acid and DMA to form DMN. The smaller yields of DMN in Experiment Nos. 17, 18, 20 and 21 in which extremely high reactants levels were used were surprising.

A permeation tube containing $^2\text{H}_6$ -DMA was placed in the upstream end of the reaction tube (Fig. 1) so that the air passing down the tube would carry with it a very low level of $^2\text{H}_6$ -DMA. Various concentrations of NO, NO_2 and ozone were introduced into the air stream and samples of NO_2 , ozone and organic vapors were taken at the downstream end of the reaction tube. The results are summarized in Table 3. In one experiment (No. 22) neither NO or ozone was added to the air, and no $^2\text{H}_6$ -DMN was produced. Air containing 500 ppb NO without ozone was passed through the tube, and again no $^2\text{H}_6$ -DMN was found (No. 23). However, substantial quantities of $^2\text{H}_6$ -DMN, somewhat larger than those formed in the comparable in situ experiments, were found when

Table 3. FORMATION OF DMN FROM OZONE, NO, NO₂ AND DMN IN A FLOW TUBE

Experiment No.	O ₃ added (ppb)	O ₃ excess (ppb)	NO (ppb)	NO ₂ (ppb)	T°C	¹ H ₆ -DMA (mM)/(liters)	² H ₆ -DMA (mM)/(liters)	DMN (mM)	DMN-d6 (mM)	% yield
22	0	-	0	0	25	-	202/15.6	-	0	0
23	0	-	500	0	24	-	202/15.6	-	0	0
24	190	0	500	190	24	-	202/15.6	-	1.14	0.564
25	487	7	520	480	25	-	202/15.6	-	3.78	1.871
26	680	180	500	0	25	-	202/15.6	-	1.93	0.955
27 ^a	0	-	500	0	26	-	202/15.6	-	0.140	0.069
28 ^a	220	0	510	220	27	-	202/15.6	-	0.6	0.297
29 ^a	475	15	510	460	26	-	202/15.6	-	1.82	0.901
30 ^a	680	180	500	0	26	-	202/15.6	-	0.34	0.168
31 ^b	210	0	530	210	26	-	202/15.6	-	0.22	0.109
Ratio: (Formed in Tube): (Formed on Cartridge)										
32	690	190	500	0	500	26	392/0.422 ^c	388/30	2.67	8.63
33	690	190	500	0	500	26	392/0.422 ^c	420/32.5	2.67	8.24
34	690	190	500	0	500	26	392/0.422 ^c	388/30	2.44	7.06
35	700	200	500	0	500	22	140/30	140/0.125 ^c	lost	lost
36	700	200	500	0	500	22	140/30	140/0.125 ^c	4.44	1.96

^a Irradiated with UV lamp, 22 cm zone centered 1.7 m from downstream end of tube, see Fig. 1.

^b Irradiation zone centered 0.6 cm from downstream end of tube.

^c Preloaded on cartridge.

ozone was added to the air stream (Nos. 24-26). These experiments were conducted with the reaction tube covered with aluminum foil. In order to test the effect of ultra-violet radiation on formation of DMN in the flow tube, a 22 cm length near the upstream end was uncovered and irradiated with a Sylvania 110V, 275W sunlamp (Nos. 27-30). The flow tube was constructed of 40 mm o.d. standard wall (~2 mm) Pyrex[®] tubing. Light penetrates this thickness of Pyrex with 50% transmission at $\lambda = 3170\text{\AA}$.⁽¹³⁾ Oxygen and NO photolyses occur only at lower wavelengths than could have penetrated the tube, but NO₂ and O₃ are photolyzed to produce oxygen atoms under these conditions, so that formation of DMN by a free radical mechanism might be possible. However, some ²H₆-DMN was found even in the absence of added ozone. It could have formed in a photochemical reaction, but it was more likely DMN formed in previous runs was stripped from the walls of the tube as a result of its being heated by the lamp. Regardless whether DMN is formed by a second (photochemical) mechanism, it appears significant that in general less of it was found when part of the flow tube was exposed to ultra-violet light, especially when the irradiation was done near the downstream end (No. 31). This indicates that the rate of DMN photolysis must be more rapid than the rates of its formation in any photochemical processes which might occur in the flow tube under the prevailing conditions. In order to distinguish between DMN formed in situ by conversion of DMA adsorbed on the Tenax cartridge and DMN formed from DMA flowing through the tube, a series of experiments was carried out in which air containing ²H₆-DMA, NO_x, and ozone was passed through the flow tube and sampled with a cartridge which had been preloaded with ¹H₆-DMA (Nos. 32-34). Approximately three times as much ²H₆-DMN as ¹H₆-DMA was found. This experiment was repeated in reverse fashion, with ¹H₆-DMA being collected on a cartridge preloaded with ²H₆-DMA (Nos. 35 and 36), and the amount of ¹H₆-DMN collected was more than double the ²H₆-DMA formed on the cartridge.

To determine the extent to which DMN that had formed in the reaction tube might have adhered to the glass wall, samples were taken after the flow tube experiments had been completed and the permeation tube had been removed. In preparation, the reaction tube was cleaned by heating it from ambient to 75°C over a period of 30 minutes while passing 5 l/min of air through it. During this time a 30 l sample was taken on a Tenax cartridge

at the downstream end of the tube. $^2\text{H}_6$ -Dimethylamine had last been passed through the tube eight days before. During the intervening time the tube had been used for several other experiments. When the cartridge was desorbed and analyzed for $^2\text{H}_6$ -DMN, 7.84 nM were found. A second 30 l sample was then taken (30 min sampling period) while the tube was maintained at 75°C to confirm that it had been purged free of $^2\text{H}_6$ -DMN and none was found. The tube was cooled to room temperature and $^2\text{H}_6$ -DMA, NO_2 and ozone was passed through it for 1 hr. Following this a 5 l/min stream of clean air was again passed for 48 min while the temperature was raised to 75°C and a 45 l sample was collected on a Tenax cartridge. On this cartridge only 0.20 nM of $^2\text{H}_6$ -DMN were found. The amount of DMN that was retained during any of the experiments in Table 3 was probably small, since only a small quantity of DMN was recovered by stripping immediately after passing DMA through the tube for an hour. Since a much larger quantity of DMN was accumulated on the tube during four days of passing D_6 -DMN through it, and since a substantial amount remained on the tube for eight days afterward, it would appear that desorption of DMN from a glass surface is a very slow process at room temperature. This means that (1) only a small amount of DMN is lost during the course of an experiment by adsorption on the tube, and (2) desorption of DMN from the tube at ambient temperatures is too slow to significantly affect the results of subsequent experiments. This further implies that either most of the DMN is formed in homogeneous, gas-phase reactions or that heterogeneous formation of a molecule of DMN does not usually result in its adsorption. It was apparent that formation of DMN from NO_2 , ozone, and DMA was less efficient in a Tenax GC sorbent bed than it was in a glass flow tube.

Since no distinction could be made between homogeneous gas phase reactions occurring in the flow tube and heterogeneous reactions taking place on its walls, additional experiments were necessary. Also, a precise control of the permeation rate for $^1\text{H}_6$ -DMA and $^2\text{H}_6$ -DMA was instituted through a slight modification of the apparatus (Fig. 3) to permit thermostatic control of the environment of the permeation tube. This was done by passing the nitrogen carrier gas from a permeation chamber (30°C) down the axis of the flow tube through 316 stainless steel 1/4 in o.d. tubing to the delivery point, where it passed into the air stream through a coarse Pyrex[®] frit

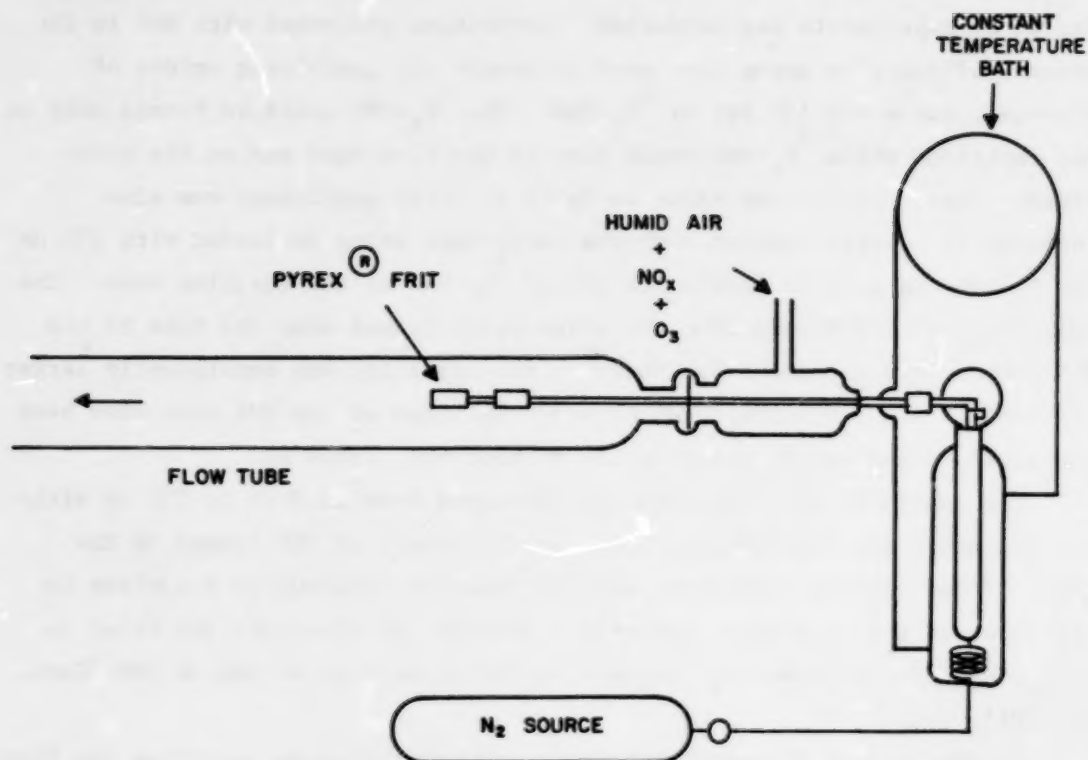


Figure 3. Thermostatically controlled chamber for permeation tube:
modified flow tube for in situ reaction experiments.

(Fig. 3). Between experiments the walls of the flow tube were heated to 60°C for 1 hr while purging with air free of NO_x, ozone, and DMA to remove residual DMN from previous reactions.

To further examine the possibility of conversion of DMA to DMN on the sorbent itself and whether the same conversion might not occur on the walls of a sampler inlet tube, or even in the vapor phase in air, an additional series of experiments was conducted. Cartridges preloaded with DMA in the absence of reactive gases were used to sample air containing oxides of nitrogen, ozone and 151 ppb of ²H₆-DMA. The ¹H₆-DMN could be formed only on the cartridge while ²H₆-DMN could form in the flow tube and on the cartridge. These results are shown in Table 4. Each experiment was also repeated in reverse fashion with the cartridges being preloaded with 202 nM of ²H₆-DMA and used to sample 131 ppb of ¹H₆-DMA in the reaction tube. The mole ratio of DMN formed from the amine which passed down the tube to the DMN formed from the amine preloaded on the cartridge was consistently larger than one. This was interpreted to mean that some of the DMA must have been converted to DMN before reaching the sorbent bed (Table 4).

The length of the flow tube was increased from 15.8 cm to 130 cm without producing any significant change in the amount of DMN formed in the tube. These results suggested that the reaction occurred on a surface in the inlet of the cartridge (Table 4). Heating the flow tube and inlet to 70°C produced a substantial increase in the conversion of DMA to DMN (Expt. No. JDI).

To distinguish between homogeneous and heterogeneous reactions the flow tube was replaced with one having a larger diameter. The flow rate of air was increased to maintain the same linear velocity (520 cm/sec) as in the previous experiments. The upstream DMA permeation tube was replaced with one having a higher permeation rate in an attempt to achieve the same DMA concentration in the reaction tube. The new permeation tube provided a DMA concentration of 466 ppb or 3.5 times that which was used in the smaller i.d. flow tube. This would be expected to lead to a three-fold increase in the production of DMN in the flow tube if it were formed in a homogeneous gas-phase reaction. Also, the mole ratio of DMN formed in the tube and cartridge to the DMN formed only on the cartridge would become substantially larger than 4, since it was already larger than 1 before the change was

Table 4. EFFECT OF OZONE, NO, NO₂ AND DNA ON IN SITU FORMATION OF DMN

Experiment No.	O ₃ added (ppb)	O ₃ excess (ppb)	NO _x (ppb)	NO (ppb)	NO ₂ (ppb)	T°C	Flow rate		I _{H₆-DNA} (nl/liters)	2 _{H₆-DNA} (nl/liters)	I _{H₆-DMN} (nm)	2 _{H₆-DMN} (nm)	DMN formed (%)	Ratio I _{H₆-DMN} /2 _{H₆-DMN}
							Tube ltr	(liter/min)/ (mm)						
OX1 ^a	-	-	-	-	-	-	-	-	-	404/0.312 ^b	0	0.017	0.004	
OX2	685	125	560	0	560	24	5/35	0/50	0/50	-	0	0.017	0.067	
OX3	685	125	560	0	560	24	5/35	0/10	0/10	202/0.156 ^b	0	0.137	0.107	
OX4	685	125	560	0	560	24	5/35	0/30	0/30	202/0.156 ^b	0	0.217	0.077	
OX5	685	125	560	0	560	24	5/35	0/50	0/50	202/0.156 ^b	0	0.156	0.077	
CX1	265	45	220	0	220	23	5/35	0/10	0/10	202/0.156 ^b	0	0.093	0.046	
CX2	270	50	220	0	220	23	5/35	0/30.3	0/30.3	202/0.156 ^b	0	0.156	0.107	
CX3	270	50	220	0	220	24	5/35	0/10	0/10	404/0.312 ^b	0	0.156	0.038	
CX4	270	50	220	0	220	24	5/35	0/30	0/30	404/0.312 ^b	0	0.156	0.038	
CX5	920	180	740	0	740	25	5/35	0/10	0/10	202/0.156 ^b	0	0.225	0.111	
CX6	920	180	740	0	740	25	5/35	0/30	0/30	202/0.156 ^b	0	0.150	0.074	
CX7	905	185	720	0	720	26	5/35	0/10	0/10	404/0.312 ^b	0	0.287	0.071	
CX8	905	185	720	0	720	26	5/35	0/30	0/30	404/0.312 ^b	0	0.212	0.052	
HD1	0	0	0	0	0	26	5/35	202/37.6 ^c	202/37.6 ^c	0/0	0	0.212±0.05		1.46
HD1.2	625	95	530	0	530	25	5/35	202/37.6 ^c	202/37.6 ^c	202/0.156 ^b	0.310±0.10	0.400		1.25
HD4 ^a	565	20	560	15	545	25	5/35	202/37.6 ^c	202/37.6 ^c	202/0.156 ^b	0.500	0.312		1.29
HD5	570	25	555	10	545	25	5/35	202/37.6 ^c	202/37.6 ^c	202/0.156 ^b	0.405	0.425		1.11
HD6	570	25	555	10	545	25	5/35	202/37.6 ^c	202/37.6 ^c	202/0.156 ^b	0.472	0.437		0.43
HD7 ^a	620	105	515	0	515	27	5/35	202/0.176 ^b	202/0.176 ^b	202/32.8 ^c	0.189	0		0.196
HD8 ^a	0	0	0	0	0	22	5/35	0/0	0/0	202/32.8 ^c	0	0		
HD10.11	532	2	590	60	530	23	5/35	202/0.176 ^b	202/0.176 ^b	202/32.8 ^c	0.081±0.04	0.412±0.15		

Table 4 (cont'd)

Experiment No.	O ₃ added (ppb)	O ₃ excess (ppb)	SO ₂ (ppb)	NO (ppb)	NO ₂ (ppb)	T °C	Flow rate (liter/min) / (mm)	I _{H₆-DMA} (nm) / (liters)	2 _{H₆-DMA} (nm) / (liters)	DHN formed (%)	Ratio I _{H₆-DMA} ² /I _{H₆-DMA}
Ln1 ^a	630	90	540	0	540	21	5/35	202/37.6 ^d	0.256	0.200	1.28
Ln2 ^a	512	7	535	30	505	23	5/35	202/37.6 ^d	0	0	
Ln7 ^a	635	90	545	0	545	24	5/35	202/32.8 ^d	0.189	0.297	0.66
Ln10 ^a	637	7	510	30	480	23	5/35	202/32.8 ^d	0.148	0.312	0.47
JN1 ^{a,e}	469	4	500	35	465	26	5/35	202/32.8 ^d	0.243	0.625	0.38
BN1	228	3	485	260	225	22	23.6/76	202/10.6 ^c	0.391	0.137	2.85
BN6 ^a	233	3	500	270	230	23	23.6/76	202/10.6 ^d	0.256	0.100	2.56
BN7 ^a	242	2	515	275	240	23	23.6/76	202/10.6 ^f	0.391	0.125	3.13

^aFlow tube heat purged 1 hour to 75°C before this run.^bPreloaded on cartridge in the absence of reactive gases.^cAmine delivered to air stream 15.8 cm from flow tube exit.^dAmine delivered to air stream 1.3 m from flow tube exit.^eFlow tube maintained at 70°C during this run.^fAmine delivered to air stream 70 cm from flow tube exit.

made. If the reaction were heterogeneous, then less DMN would be produced in the tube since the surface to volume ratio was decreased from 1.14 to 0.53 in going from the smaller to the larger tube. This would cause the mole ratio to decrease since the amount of amine from the tube drawn into the cartridge (1 l/min) was kept constant.

The result actually obtained was a less than three-fold increase in the mole ratio (Table 4). Furthermore, the ratio was substantially independent of the length of the tube. This means that while some conversion of amine may have occurred in the flow tube, most of the DMN formation happened in front of the cartridge and it must have taken place on the glass fiber filter and/or the glass fiber plug which was used to anchor the Tenax GC in the cartridge. However, the percent conversion of DMA to DMN was in all cases very small (Table 4).

The results obtained in this study show that it is important to obtain simultaneous data on atmospheric concentrations of NO_x , O_3 , and amines when sampling for nitrosoamines. A control such as the addition of $^2\text{H}_6$ -DMA to the sampling stream should be used to determine those environmental factors which may contribute to in situ DMN formation. This would be especially necessary to any attempt to show that nitrosoamines had been formed in the atmosphere from reactants.

An examination for other potential in situ reactions on Tenax GC was also made. In all of the experiments previously described (particularly those using ~2 ppm NO_x) there was no indication of the formation of 2,6-diphenyl-p-quinone which has been reported for more corrosive atmospheres such as stationary source sampling.⁽¹⁴⁾ These observations were consistent with our previous report.⁽⁴⁾ Nevertheless, we have attempted to precisely define in this investigation the sampling conditions for which representative atmospheric samples may be procured and the limitations of the devices used, in particular the glass fiber filter. We believe that it is important to fully characterize any new sampling device prior to its widespread usage.

SECTION 6
PERMEATION SYSTEM FOR SYNTHESIZING AIR/ORGANIC VAPOR MIXTURE
FOR CALIBRATING INSTRUMENTS

The four general factors which affect the sensitivity of an analytical procedure for the analysis of carcinogenic vapors in ambient air have previously been discussed.⁽⁴⁾ A procedure for the calibration of instruments for quantitative analysis must systematically account for these factors. It is difficult to deliver aliquots of concentrations (ppt) near the lower detection limits so that calibration plots often are needed to be extrapolated out of their region of validity. Because of the long-term variation in sensitivity of the analytical system as well as the variation of the system's sensitivity to different chemical classes, numerous compounds need to be used for calibration. Sensitivities of vapors relative to standard compounds in the gc/ms system may be measured and have previously been reported for several selected compounds.

Sampling of air to which known quantities of vapors have been added would account for the errors inherent in collection and analysis procedures, but such low concentrations are subject to rapid depletion by adsorption onto surfaces of vessels used for providing calibration standards. This problem can be circumvented by the use of permeation or diffusion tubes which at a controlled temperature emit a vapor at a constant lower rate. The concept thus utilizes a stream of air or N₂ passing over a group of permeation or diffusion tubes in a thermostated chamber which picks up a low concentration of vapor from each tube. Surfaces in the flow system become equilibrated with these compounds so that they can be delivered from the system at the same rate that they were emitted by the permeation or diffusion tubes. The permeation rate can be determined gravimetrically by weighing each tube at periodic intervals.

A permeation system for synthesizing air/organic vapor mixtures for the calibration of instruments was designed and previously reported.⁽⁴⁾ The

preparation of a series of permeation tubes for calibrating the gc/ms/comp system for analysis of field samples has also been reported.⁽⁴⁾ Permeation rates (g/min/cm) ranged from 1×10^{-6} to $\sim 1 \times 10^{-10}$ using the plastic materials TFE, FEP and polyethylene. It had also previously been determined that the permeation rate was highly dependent on the vapor pressure, the chemical properties of the substance and the plastic material chosen for the preparation of permeation tube.⁽⁴⁾ The use of permeation tubes appears to be a feasible technique for synthesizing accurate and reproducible air/organic vapor mixtures.

The previously reported permeation flow system was modified to incorporate improvements which will be discussed in this section. The performance of this permeation flow system for accuracy and reproducibility to deliver known concentrations of air/vapor mixtures to cartridges was tested. A number of permeation tubes containing non-polar, semi-polar and polar organics for synthesizing an array of air/vapor mixtures were examined. Linear regression analysis was used to determine the permeation rate for each of the organic vapors.

The performance of several permeation tubes over an extended period of time was examined as well as the effect of cold storage on their stability of permeation rate.

EXPERIMENTAL

The design flow system is depicted in Figure 4. The components were connected with 1/8" o.d. Teflon tubing. The Pyrex permeation tube (25 mm i.d. x 44 cm in length) was enclosed in the jacket through which an ethanol/water mixture was circulated from a constant temperature bath (Haake Model FE circulating pump and thermostated heater coupled with a Haake Model C11 refrigeration unit). The carrier gas (N_2 or air) from a lecture bottle was regulated with a Matheson 8-588D regulator and passed through a scrubber (charcoal). A low pressure regulator was placed in line between the carrier gas supply and the permeation chamber in order to regulate constant upstream and downstream pressures to provide a uniform flow. The low pressure regulator was a Moore 40-2 regulator, with a Matheson 63-3101 pressure gauge placed between the Moore regulator and the permeation chamber. Before entering the permeation chamber, the carrier gas was passed through a temperature equilibration coil which was ~ 4 ml i.d. x 1 m in length. Upon

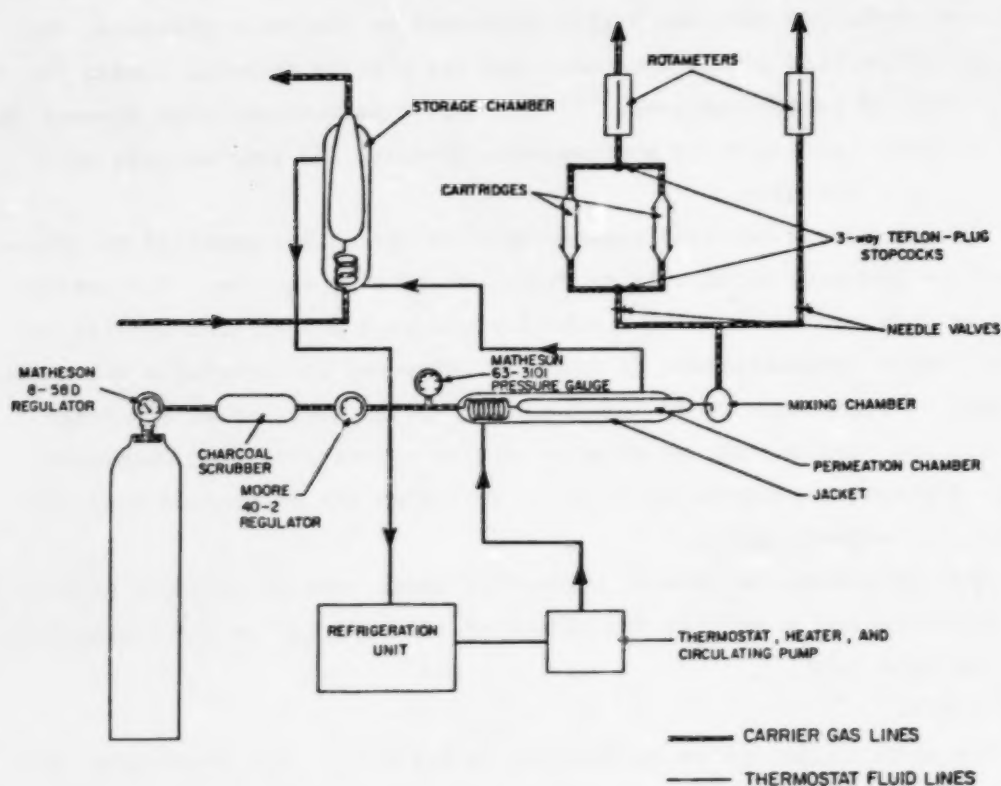


Figure 4. Schematic of permeation tube flow system for synthesizing air/vapor mixtures.

leaving the chamber, the carrier gas/vapor stream passed through a 100 ml mixing chamber before being split. The air/vapor mixture was split and regulated between two parallel lines by needle valves. On one leg of the split system, the air/vapor mixture could be directed through two additional legs via a three-way teflon plug stopcock to deliver vapors to Tenax GC cartridges in parallel. The effluents from the cartridges were monitored with a rotometer (Brooks Instrument Div., Emerson Electric Co., R-2-15-C) containing a glass float. The second leg of the system served as a method of by-passing excessive flow. The second leg of the split system was also monitored with a rotometer (Brooks Model R-2-15-D) with a Tantalum float. A type 3155 tube size R-2-15-AAA rotometer was used in each branch of the flow system. The reproducibility of the rotometer which measured flow through the cartridge and excess flow branch has previously been described.⁽⁴⁾

A large permeation chamber connected to the constant temperature bath was flushed continuously by a 100 ml/min N_2 stream and was used to store permeation tubes. This permitted calibration of the tubes without interfering with the operation of the flow system and the immediate use of the stored tubes without waiting for equilibration of the permeation rate.

This system could be used either to load sorbent cartridges or to deliver vapors to a stream of air entering a cartridge sampler. A cartridge holder consisting of two Beckman teflon reducing unions (No. 830511) was used for holding sampling cartridges. The upstream union was fitted with a teflon plug which had a 2 mm i.d. bore to minimize dead volume.

Permeation tubes for several typical compounds were prepared for assessing their long-term storage stability and for the calibration of instruments. They were made of ~7-15 cm lengths of plastic tubing. Three kinds of tubing were used: polyethylene (PE, 0.25 in o.d. x 0.19 in i.d.) and two types of teflon tetrafluoroethylene (TFE) and fluorinated ethylene and propylene (FEP) were used. The ends were closed with glass plugs secured by stainless steel ferrules.⁽⁴⁾ This technique was used for the preparation of all of the permeation tubes described in this section. The plastic tubing and the end plugs withstood the pressure of compounds as volatile as dimethylamine at ambient temperatures.

RESULTS AND DISCUSSION

Performance of a Gas Flow System for Delivering Vapors from Permeation Tubes

Previously a flow system was described which consisted of a stream of N_2 gas delivered from a Matheson 8-580 regulator through a Hoke 20-turn needle valve to a thermostated chamber which could contain one or more permeation tubes.⁽⁴⁾ In this system, the effluent stream from the chamber was split by a pair of Hoke 20-turn needle valves and part of it was delivered to a sampling cartridge while the rest was delivered to a flame ionization detector (FID). The flow rate in each branch was measured with a calibrated rotometer (Brooks Instrument Model 1355 with R-2-15-AAA tube and a glass float). The FID was used to evaluate the stability of the rate of delivery of vapors from the system. The FID-system could not be used to deliver vapors to sampling cartridges because the back pressure on the rotometer due to flow resistance of the flame tip resulted in some error in flow rate measurements above 35 ml/min when the FID was connected to the system. During the previous studies, observations of the FID signal during operation of the flow system revealed that: (1) small variation in pressure supplied by the 8-580 regulator were amplified in the branch of the flow system receiving the smaller part of the flow; (2) it was very difficult to establish and maintain a stable pressure in the system as exhibited by the sinusoidal wave in the FID signal; (3) removal and replacement of cartridges disturbed the pressure and therefore the flow rates in the system. Occasionally this disturbance as indicated by the FID signal remained evident during a substantial fraction of the sampling period. Thus, appropriate modifications to the system were made as shown in Figure 4 and their effects on performance as evaluated by observation of the FID signal are reported here. The system was modified to include an oil manometer which replaced a Matheson 63-3101 pressure gauge (0-15" water). A Moore Products Co. model 40-2 low pressure regulator was used to supply carrier gas to the system as shown in Figure 4. Parallel cartridge holders were installed and connected to the system by a pair of 2 mm teflon plug three-way stopcocks⁽⁴⁾ which permitted removal and insertion of cartridges without interrupting the carrier gas flow.

For comparison, an initial series of experiments (Table 5) was carried out using only the 8-580 regulator with needle valves. Then a series of

Table 5. EFFECT OF METHOD OF CARRIER GAS DELIVERY ON STABILITY OF THE LEVELS OF VAPORS DELIVERED BY A FLOW SYSTEM CONTAINING PERMEATION TUBES

Method of Nitrogen Carrier Gas Supply	Chamber Pressure (in H ₂ O)	Flow Rates (ml/min)		To FID	Signal Level (Arbitrary Units)	Noise (% Signal)	Drift (% Signal)	Duration of Observation (min)
		Discarded	Discarded					
Matheson 8-580 regulator (7 psig) to a Hoke 20-turn needle valve ^a	9.2	0		59.8	428.0	2.2	1.5	54
	1.9	29.8		29.6	160.0	1.0	4.0	37
	1.9	44.8		14.8	30.0	1.3	6.0	69
	1.8	49.5		9.5	20.8	1.3	3.8	82
Matheson 8-580 regulator (20 psig) to a Hoke 20-turn needle valve followed by 0.8 m of 0.009 in stainless steel capillary ^a	2.0	0		56.7	483.2	0.7	2.6	70
	1.9	29.6		28.4	183.4	1.0	8.0	52
	2.0	44.7		14.4	20.2	2.0	7.5	39
	2.1	49.6		9.3	9.7	2.1	6.2	24
Matheson 8-580 regulator (20 psig) to a Moore 40-2 regulator (15" H ₂ O) followed by a Hoke 20-turn needle valve ^a	2.0	0		57.2	499.2	0.9	2.6	20
	2.05	30.1		29.4	190.4	1.9	9.6	28
	2.0	44.8		15.1	33.0	1.2	7.4	72
	2.0	52 ^b		9.1	20.4	0.8	2.9	38
Matheson 8-580 regulator (20 psig) to a Moore 40-2 regulator set to permeation chamber pressure ^a	2.0	0		59.4	512.0	0.6	1.9	61
	2.0	30.0		29.8	211.2	0.6	2.4	54
	2.0	44.8		15.0	33.3	1.2	4.1	90
	2.0	49.7		9.2	20.2	1.0	3.4	190

(continued)

Table 5 (cont'd)

Method of Nitrogen Carrier Gas Supply	Chamber Pressure (in H ₂ O)	Flow Rates (ml/min) Discarded	To FID	Signal Level (Arbitrary Units)	Noise (% Signal)	Drift (% Signal)	Duration of Observation (min)
As above ^c	1.95	0	61.2	1546.0	0.8	3.6	65
	2.0	29.1	29.9	634.9	1.0	2.4	60
	2.0	45.0	15.6	112.8	0.7	2.6	47
	2.0	49.5	9.0	70.2	0.4	3.2	104
	2.0	49.7	6.3	54.8	1.2	4.4	109
As above ^d	5.0	0	58.8	675.2	1.1	2.8	44
	5.0	29.0	30.3	271.2	1.2	6.5	270
	5.0	45.3	15.0	46.7	0.7	3.2	43
	5.0	50.6	9.9	33.4	1.0	1.9	38

^aPermeation tubes used were benzene (2.34×10^{-7} g/min), toluene (1.12×10^{-7} g/min), and benzene-d₆ (1.68×10^{-7} g/min).

^bEstimated. Flow rate exceeded range of rotameter.

^cPermeation tubes used were acetone (1.67×10^{-7} g/min), chlorobenzene (1.12×10^{-7} g/min), and 2-butanone (1.76×10^{-6} g/min).

^dPermeation tubes used were acetone (1.67×10^{-7} g/min) and chlorobenzene (1.12×10^{-7} g/min).

experiments was run in which the 8-580 regulator and needle valve were augmented by a capillary flow resistor. A third series of experiments was run in which the 8-580 regulator supplied pressure to the 40-2 low pressure regulator and the flow rate from it to the permeation chamber was regulated by a needle valve. Finally a series of experiments was run in which the 40-2 regulator was used to set the pressure directly in the permeation chamber with the flow rates being controlled by the needle valves which were used to split the flow. In this series of experiments, the permeation tubes containing benzene, benzene-d₆ and toluene were employed.

Performance of the flow system was evaluated in terms of stability of the signal from the FID with respect to two criteria: "noise" and "drift". Noise was defined as variation in signal level over a period of 15 sec or less and it consisted substantially of oscillations about the mean signal level. It was expressed as a percentage of the lowest observed signal level. Part of the noise originated in the FID electrometer, but some of it also originated in the flow system. Drift consisted of variations in signal level over a period exceeding 15 sec. It also was expressed as a percentage of the lowest observed signal level. It did not generally take the form of a oscillation and apparently resulted most from variation in flow rate although other instrumental sources of signal drift were possible. The lengths of observations were recorded because a long period of observation was a more stringent test of signal stability than a short one. For each series of experiments, several different flow rates to the branches of the system were used.

The first series of runs using a 8-580 regulator with needle valve gave results substantially in agreement with those obtained earlier under these conditions.⁽⁴⁾ There was up to 6% drift in the signal (Table 5). It was evident that much of this drift resulted from pressure instability due to the use of the combination of three needle valves to set flow rates. This instability increased with pressure and had resulted in the conclusion reached previously that it would be impractical to operate the flow system at pressures above 0.17 psi (4.7" water). Another series of experiments were carried out at low pressure (1.9" water) and time was taken to permit the pressure to equilibrate. Use of pressure gauge rather than oil manometer permitted more accurate observation of pressure equilibration.

A series of runs was carried out using the 8-580 regulator with needle valve followed by a 0.8 m of 0.09 in i.d. stainless steel capillary. The purpose of the additional flow resistor was to dampen fluctuations in the pressure output of the 8-580 regulator to produce a more stable flow rate. However, it turned out to be extremely difficult to set a predetermined chamber pressure with this arrangement. The noise level of the FID signal was reduced only if all the flow was to the FID. Due to the decrease in flow stability, the signal drift was increased.

The capillary flow resistor was removed and the Moore Products Co. Model 40-2 low pressure regulator was inserted between the 8-580 regulator and the needle valve. It was set to 15" water pressure for output pressure and the flow rate was regulated with the needle valve. A slight reduction in noise resulted, but drift was unaffected.

The 40-2 regulator was placed immediately upstream of the permeation chamber with no valve or other flow resistor between it and the chamber. It was used to set the pressure in the chamber and the flow rates were controlled only by the needle valves which were used to split the flow (Fig. 4). There was a slight decrease in noise and signal drift was reduced. Some of the percentages of signal drift recorded in Table 5 were slightly higher for this arrangement than for others, but the duration of observation was also much longer. What was more significant than the small improvements in drift and noise was the very large increase in the convenience and speed of setting pressures and flow rates. This was a most significant improvement in the system which was made by introducing the 40-2 regulator.

A series of experiments was performed using permeation tubes of polar compounds (acetone, chlorobenzene, 2-butanone) in order to determine whether slow desorption from flow tube walls by polar compounds might adversely affect the performance and background of the system. If the proportion of flow to the FID were maintained at a certain level for a while and then abruptly reduced, this would be observed as a gradual decrease in signal level until the amount of material adsorbed on the walls had equilibrated. Such an effect was observed, but it was slight and it did not significantly affect the observed signal drift if observations were started 20 min after changing the flow rates.

The effectiveness of the parallel cartridge holders for rapid changing of cartridges with minimum disturbance of the flow system was evaluated. The flow resistance of the Tenax cartridges is quite low at the flow rates which are utilized in this permeation system and only a small drop in the rotometer reading was observed when flow was switched from an empty cartridge tube to one packed with Tenax. The decrease in flow rate was generally no more than 5% and it was more evident as a drop in the FID signal than the rotometer reading. It was nevertheless a source of error which could be minimized by first establishing the flow rate with the Tenax cartridge in-line as a flow resistor since the difference in the flow resistance between two Tenax GC cartridges is normally very small. By this means a change in signal level could be reduced to 2% or less at a pressure of 2" of water. Use of gauge pressures higher than 2" water should minimize flow rate fluctuations due to differences in flow resistance of individual cartridges. On the other hand, use of elevated pressures could potentially lead to errors in the calibration of permeation tubes. If a permeation tube were subjected to very large changes in ambient pressure, gains and losses of weight due to permeation in and out of the tube of the gas in which it was immersed might occur. Changes in pressure due to natural fluctuations in barometric pressure would be too small to cause significant calibration errors. Therefore use of permeation tubes at gauge pressures which are small compared to natural fluctuations in barometric pressure could not adversely affect performance.

The performance of the modified flow system was re-evaluated at a pressure equivalent to 5" water. The signal drift and oscillation previously observed⁽⁴⁾ were absent. Noise was minimal and drift was slight except for one observation which lasted for 4.5 hrs. There was no indication that the system was approaching a high pressure limit for practical operation. Behavior of the signal level when changing from one Tenax cartridge to another was observed at pressures up to 6" of water (Table 6). No significant fluctuations in signal level occurred at 4" of water and above. The influence of pressure on the time required for the signal level to stabilize after insertion of permeation tubes in the system was also observed (Table 6). It was found to be insignificant. The signal level approached its final level

Table 6. EFFECT OF CARRIER GAS PRESSURE IN THE PERMEATION CHAMBER ON VARIATIONS IN FLOW RATE AND TIME REQUIRED FOR STABLE DELIVERY OF VAPORS

Chamber Pressure (in H ₂ O)	Change in Signal Level Due to Change in Cartridges ^a (%)	Time Required to Attain Final Signal Level After Insertion of Permeation Tubes in Chamber (min)
2.0	1.7	24
2.1	2.3	-
3.5	-	20
4.0	0.5	-
5.0	-	33
6.0	0.0 ^b	20

^aIndividual Tenax cartridges vary slightly in flow resistance.

^bSignal level drifted 0.5% after 40 min.

within about 20 min and sometimes required a short additional period to stabilize completely.

In summary, the best method of delivery of carrier gas to the permeation tube flow system is to control the pressure in the chamber with a low pressure regulator and control the flow rates only with the valves which are used to split the flow. Increasing the pressure from 2-6" of water minimizes signal fluctuation due to differences in flow resistance of individual cartridges.

Examination of Long-Term Performance of Permeation Tubes

Effect of Cold Storage--

A series of permeation tubes using several plastic tube types was prepared during the latter part of 1975. These permeation tubes were used to examine the effect of temporary storage at reduced temperature. The permeation tubes were sealed in a glass ampule and stored in the freezer at -5°C for a period of two weeks. At the end of this period, the tubes were returned to room temperature, weighed and placed in storage at 20.1°C and then weighed periodically during the subsequent months. Linear regression analyses of the data obtained on the permeation rates for the periods of February-April May-July are presented in Table 7. The tubes returned to approximately their former permeation rates after cold storage, but none of the rates after storage were precisely the same as initially. Weight losses which occurred during the first six days after the cold period was terminated indicated elevated permeation rates. This might of course have occurred as a result of moisture which could condense on the tubes while they were cold. It is apparent from these data that a calibrated tube will return to approximately its former permeation rate after cold storage, but recalibration after cold storage would be necessary for maximum accuracy.

Stability of Permeation Rates--

Some permeation tubes which had been prepared during January and February had not stabilized by April. Periodic weighings were made during the months of May-July and linear regression analysis was contrasted with that taken during February-April of 1976. These results are shown in Table 8. It is evident that with several notable exceptions, the permeation rates had actually reached their final level within four months. These tubes for which the permeation rate had not stabilized were phenylacetylene (FEP);

Table 7. RATES OF WEIGHT LOSS FOR PERMEATION TUBES
BEFORE AND AFTER STORAGE AT -5°C

Compound	Plastic	Permeation Rate (g/min)		
		<u>Determined by Linear Regression</u>		<u>Determined by Weight Loss</u>
		Feb.-April	May-July	May 18-24
acetone	PE	1.74	1.67	1.68×10^{-6}
	TFE	3.97	3.83	4.45×10^{-7}
	FEP	5.87	6.37	9.01×10^{-8}
benzene	TFE	2.44	2.34	3.22×10^{-7}
	FEP	2.47	2.70	6.74×10^{-8}
dichloromethane	FEP	3.01	2.95	3.42×10^{-7}
chloroform	FEP	5.56	6.10	10.6×10^{-8}

Table 8. RATES OF WEIGHT LOSS FOR PERMEATION TUBES
DETERMINED OVER TWO EXTENDED TIME PERIODS

Compound	Plastic	Permeation Rate (g/min) Determined by Linear Regression	
		Feb.-April	May-July
toluene	TFE	1.07×10^{-7}	1.12×10^{-7}
	FEP	4.07×10^{-8}	4.14×10^{-7}
phenylacetylene	TFE	4.12×10^{-8}	4.11×10^{-8}
	FEP	9.54×10^{-9}	4.73×10^{-9}
1,1,1-trichloroethane	TFE	8.75×10^{-9}	1.31×10^{-8}
	FEP	2.03×10^{-9}	1.06×10^{-9}
tetrachloroethylene	TFE	1.50×10^{-7}	1.85×10^{-7}
	FEP	6.52×10^{-8}	3.80×10^{-8}
chlorobenzene	TFE	1.07×10^{-7}	1.12×10^{-7}
	FEP	1.31×10^{-6}	1.10×10^{-6}
<u>m</u> -dichlorobenzene	TFE	3.40×10^{-7}	3.68×10^{-7}
	FEP	2.58×10^{-8}	Gained weight
dichloromethane	TFE	2.28×10^{-6}	1.84×10^{-6}
chloroform	TFE	1.14×10^{-6}	1.13×10^{-6}
carbon tetrachloride	TFE	5.99×10^{-9}	3.78×10^{-8}
	FEP	Gained Weight	Gained Weight

1,1,1-trichloroethane (FEP and PFE); tetrachloroethylene (FEP); m-dichlorobenzene (FEP) and carbon tetrachloride (TFE and FEP). In all cases for which tubes had not stabilized, the permeation rates were below 10^{-7} g/min.

The reason for failure of a tube to obtain a steady permeation rate in a reasonable length of time was not evident. There appeared to be several possible explanations: (1) tubes with very low permeation rates require a very long time period to stabilize. This is probably what is being observed when the permeation rate increases over a long period of time without ever approaching a steady state and without ever reaching 10^{-7} g/min. (2) Chemical reactions might occur between the vapor and the plastic material. This could explain either an increase or decrease in permeation rate but is not likely to occur in those cases because the plastics used are relatively unreactive. (3) Chemical reaction of the liquid inside the tube might occur. This could explain either an increase or decrease in the permeation rate. It is plausible in the cases where the compound is known to polymerize or readily decompose. (4) Chemical reactions of vapors from outside the tube with the outside surface of the tube and/or with the vapor permeating from the tube at its surface might occur. It would seem to be rather improbable at the vapor concentrations prevailing in the storage chamber which is swept by a 100 ml/min N_2 stream, but it cannot be definitely ruled out. (5) Teflon is not extremely hygroscopic, but the tubes are stored in a dry N_2 stream and when they are removed for weighing, they may pick up some moisture from the ambient air. If the permeation rate is very low, weight loss over a reasonable period of time might be obscured by gains or losses of water. This could result in a small weight gain or an erratic rate of weight loss for tubes which have a very small permeation rate. (6) It is known that polymeric materials will change structurally, i.e., swell when they come in contact with organic liquids. It is conceivable that a physical change occurs in the plastic material when it becomes saturated with the organic liquid. If swelling occurs, this could cause a change in the porosity, thus a change in the permeation rate. Of all the above explanations, the latter is probably the most significant in explaining why such a long period is required for stabilization of the permeation rate and for the changes in the permeation rate with respect to time for some of the chlorinated materials in a plastic tube. The

observations described here establish some practical limits for the use of permeation tubes in an experimental apparatus for which they must be removed for weighing: (1) the tubes should be maintained at a temperature high enough so that the compound has a substantial vapor pressure in order that the permeation rate may be reasonably large; (2) unstable or highly reactive compounds may not be suited for use in permeation tubes unless the permeation rate is large enough that the rate stabilizes and the tube can be used within a suitably short period of time; (3) use of an organic liquid permeation tube under conditions in which the permeation rate is substantially below 10^{-7} g/min does not appear to be practical. The higher the permeation rate, the more quickly steady permeation is reached and the more stable is the observed permeation rate. In order to use tubes which permeate faster than 10^{-7} g/min, some form of flow splitting is required to obtain the low concentration needed for calibrating air sampling systems. (4) Compounds which permeate too fast from polyethylene tubes and too slow from teflon tubes might be handled either in very short polyethylene tubes attached to impermeable reservoirs or in teflon tubes maintained at elevated temperatures.

Several tubes which exhibited slow permeation rates were recalibrated at 30.4°C in order to determine what the effect of the resulting increase in vapor pressure would be on the permeation rates. Results for the higher temperature are contrasted with the original results in Table 9. It is seen that this increase in temperature effected only slight increases in permeation rates. The largest increase was for n-1,1,1-trichloroethane (PFE) which increased by a factor of 5.65. The PFE tubes for carbon tetrachloride and m-dichlorobenzene did not have a final permeation rate at 20.1°C. They frequently gained weight between weighings. The carbon tetrachloride also gained weight at 30.4°C, but it was possible to establish a permeation rate of 2.4×10^{-8} g/min from some of the data. The m-dichlorobenzene tube had an apparently stable permeation rate of 1.26×10^{-8} g/min at 30.4°C. In general permeation rates were increased very little by increasing the temperature 10°. A more practical means of handling these compounds would probably be using extremely short polyethylene tubes with attached reservoirs.

Table 9. PERMEATION RATES OF SOME HALOCARBON PERMEATION TUBES AT 20.1°C and 30.4°C

Compound	Plastic	Permeation Rate (g/min)		Ratio Rate at 30.4° Rate at 20.1°
		20.1°C	30.4°C	
Carbon tetrachloride	TFE	3.78×10^{-8}	1.88×10^{-7}	4.97
	FEP	$>10^{-8a}$	$\sim 2.4 \times 10^{-8a}$	-
1,1,1-Trichloroethane	TFE	1.31×10^{-8}	7.40×10^{-8}	5.65
	FEP	1.06×10^{-9}	$\sim 2 \times 10^{-8a}$	~ 1.9
Chlorobenzene	TFE	1.12×10^{-7}	2.28×10^{-7}	2.04
	FEP	1.10×10^{-6}	$\sim 3.4 \times 10^{-6}$	~ 3.1
m-Dichlorobenzene	TFE	3.68×10^{-7}	3.50×10^{-7}	0.95
	FEP	$>10^{-8a}$	1.26×10^{-8}	-

^a Tube gained weight between two or more weighings during this calibration.

New permeation tubes were also prepared for chloromethane and bromomethane due to the observed vapor pressures of these compounds. The permeation rates for the TFE tubes were too high to be useful and FEP tubes reached a steady permeation rate very quickly.

Polyethylene permeation tubes with attached reservoirs were prepared for carbon tetrachloride, ethyl acetate and 2-butanone. Carbon tetrachloride had too low a permeation rate through teflon tubes while it permeated at a very rapid rate through polyethylene. By making the tube very short, a useful permeation tube was obtained. The ethyl acetate and 2-butanone tubes were made to replace longer tubes which had become depleted. Several additional permeation tubes were also prepared (Table 10).

Table 11 summarizes the permeation tubes for a series of organic compounds which have been prepared with their materials of construction and specifications.

Table 10. PERMEATION RATES OF SOME PERMEATION TUBES AT 20.1°C

Compound	Length (cm)	Plastic	Permeation Rate (g/min)
Chloromethane	9.0	TFE	1.7×10^{-5a}
	6.5	FEP	1.81×10^{-6}
Carbon tetrachloride	0.8 ^b	PE	6.25×10^{-6}
Ethyl acetate	2.8 ^b	PE	1.33×10^{-6}
2-Butanone	4.8 ^b	PE	1.14×10^{-6}
1,2-Dichloroethane	8.0	TFE	2.08×10^{-7}
Bromomethane	6.0	TFE	2.44×10^{-5a}
	6.0	FEP	5.98×10^{-7}
Chlorine	2.0	c	2.03×10^{-6d}

^aPermeation rate too high to be useful. Depleted after a few weeks.

^bPyrex reservoir attached to tube.

^cPlastic type unknown. Probably FEP. Commercially prepared tube: Metronics Associates, Inc., Serial No. 98.

^dChlorine tube only: Calibrated at 30.4°C.

Table 11. PERMEATION TUBE SPECIFICATIONS FOR SEVERAL CHEMICAL CLASSES

Chemical Class	Compound	Length (cm)	Material	Rate g/min
Halogenated hydrocarbons	Methylene chloride	11	FEP	3.15×10^{-7}
	Trichloroethylene	7.5	FEP	1.17×10^{-8}
	Chloroform	10.2	TFE	1.12×10^{-6}
	<u>m</u> -Dichlorobenzene	6	TFE	1.93×10^{-7}
	<u>m</u> -Dichlorobenzene	5.8	FEP	6.82×10^{-9}
	Vinyl chloride	10	FEP	2.02×10^{-6}
	Vinyl chloride	4.8	FEP	8.17×10^{-7}
	1,1,1-Trichloroethane	8	TFE	3.42×10^{-8}
	Tetrachloroethylene	5.2	TFE	1.89×10^{-7}
	Chlorobenzene	5.5	TFE	1.55×10^{-7}
	Chloromethane	6.5	FEP	1.81×10^{-6}
	Carbon tetrachloride	8	PE	6.08×10^{-6}
	1,2-Dichloroethane	8	TFE	2.00×10^{-7}
	1,2-Dichloropropane	7.7	TFE	1.43×10^{-8}
	Bis-(2-chloroethyl)ether	8.3	TFE	1.74×10^{-8}
	2-Chloro-1,3-butadiene	9.5	TFE	6.74×10^{-8}
	3-Chloro-1-Butene	9	TFE	2.87×10^{-7}
	1,1,1,1-Tetrachloroethane	9	TFE	9.90×10^{-11}
	Dibromomethane	6.4	FEP	8.30×10^{-8}
	Dibromomethane	6.2	TFE	1.42×10^{-6}
	Methyl bromide	6	FEP	5.94×10^{-7}
	1,2-Dibromopropane	9.8	TFE	1.68×10^{-7}
	Bromine	4.4	TFE	2.23×10^{-6}
	Bromine	3.7	TFE	4.85×10^{-6}
	Perfluorobenzene	5.5	FEP	7.82×10^{-6}
	Perfluorotoluene	5.5	FEP	3.33×10^{-6}

(continued)

Table 11 (cont'd)

Chemical Class	Compound	Length (cm)	Material	Rate g/min
	Bromodichloromethane	5.7	FEP	5.89×10^{-9}
	Bromodichloromethane	5.2	TFE	3.93×10^{-7}
	1-Bromo-2-chloroethane	9.8	TFE	1.71×10^{-7}
Hydrocarbons	<u>n</u> -Heptane	12.3	TFE	2.06×10^{-7}
	1-Pentyne	10	TFE	4.33×10^{-7}
	Cyclopentane	12.2	TFE	8.89×10^{-9}
Aromatics	Benzene	12.5	TFE	2.41×10^{-7}
	Toluene	7	TFE	1.09×10^{-7}
	Benzene-d ₆	8	TFE	1.70×10^{-7}
	Benzene-d ₆	8	FEP	2.80×10^{-7}
	α -Methylstyrene	13.9	TFE	2.49×10^{-8}
	1,2,3-Trimethylbenzene	13.7	TFE	5.11×10^{-8}
	Phenylacetylene	6	TFE	3.81×10^{-7}
Amines	Dimethyl-d ₆ amine	9	TFE	1.29×10^{-6}
	Dimethyl-d ₆ amine	8	FEP	2.63×10^{-7}
	Dimethyl-d ₆ amine	7.5	TFE	7.50×10^{-7}
	Dimethylamine	9.5	TFE	1.30×10^{-6}
	Dimethylamine	7	FEP	9.72×10^{-8}
	Dimethylamine	7.5	TFE	2.37×10^{-9}
	Dimethylamine	7	TFE	5.29×10^{-7}
	Dimethylamine	2	PE	4.07×10^{-6}
Nitrogenous compounds	Nitrobenzene	9	PE	8.21×10^{-3}
	N,N-Dimethylformamide	8.7	TFE	3.96×10^{-8}
	Benzonitrile		TFE	2.63×10^{-7}

(continued)

Table 11 (cont'd)

Chemical Class	Compound	Length (cm)	Material	Rate g/min
Ketones and Aldehydes	Acetone	12.5	TFE	3.87×10^{-7}
	Methyl ethyl ketone	4.8	PE	1.19×10^{-6}
	Methyl vinyl ketone	8.6	TFE	1.59×10^{-7}
	<u>n</u> -Heptanal	10	TFE	2.49×10^{-8}
Esters and Ethers	Ethyl Acetate	2.8	PE	1.31×10^{-6}
	Methyl Acrylate	6.9	TFE	4.79×10^{-7}
	Furan	6.2	TFE	8.51×10^{-7}
	<u>n</u> -Butyl ether	6.2	TFE	8.15×10^{-8}

SECTION 7
IDENTIFICATION AND QUANTIFICATION OF VOLATILE ORGANIC VAPORS
IN AMBIENT AIR FROM SEVERAL GEOGRAPHICAL AREAS IN THE
CONTINENTAL U. S.

Three principal criteria served as guidelines for selecting the areas for study of organic vapors in ambient air. These were: (1) to demonstrate the capability of the polypollutant analysis method developed under this contract over the past several years; (2) to determine the composition of ambient air surrounding selected industrial sites; and (3) to begin acquiring information which may explain the high incidence of certain types of cancer for these areas which have been previously reported.⁽¹⁶⁾ The principal geographical areas for study were in the vicinity of Houston, TX, Baton Rouge, LA and a chemical disposal site in New Jersey. Table 12 presents the cancer mortality by county for the period of 1950-1969 for some selected metropolitan areas.^(16,17)

Houston, TX was selected as an area for examination because of the high concentration of petrochemical industries.⁽¹⁸⁾ In Houston are Jones Chemicals (chlorine), Tenneco (vinyl chloride), Diamond Shamrock (herbicides), Gulf Chemicals (pesticides, degreasers, industrial chemicals), Petrotex (chloroprene), Stauffer (pesticides), Unichem (pesticides) and a large number of other large chemical complexes which may produce or use halogenated organics. In the suburb of Pasadena are Ethyl Corp. (vinyl chloride and chlorinated ethylenes), Pestex (insecticides) and Rhodia (pesticides). In Texas City are Union Carbide (vinyl chloride), GAF (vinyl co-polymers and herbicides) and others. In Deer Park are Diamond Shamrock (tetrachloroethylene, trichloroethylene and PVC resins), Shell Chemical (vinyl chloride and pesticides) and others. In LaPorte are Chemetron (phosgene, benzyl chloroformate and phenylchloroformate), Upjohn (phosgene) and DuPont (pesticides and hydrofluoric acid). In Conroe are Helena Chemical Co. (pesticides), Conroe Cresoting (treated wood products) and United Cresoting

Table 12. CANCER MORTALITY BY COUNTY 1950-1969 (22):
U. S. AVERAGES AND SELECTED METROPOLITAN AREAS

State and County Code (City)	Cancer ^a Type	Race	Sex				
			Male		Female		
			Total Deaths Per 20 Years	Death ^b Rate	Total Death Per 20 Years	Death ^b Rate	Relative ^c Rate
United States	1	White	76,070	5.16	94,229	5.34	1.00
		Nonwhite	10,021	6.91	7,261	4.59	1.00
	2	White	571,226	37.98	108,326	6.29	1.00
		Nonwhite	53,910	36.67	10,222	6.27	1.00
	3	White	252,763	17.84	-	-	-
		Nonwhite	35,397	27.39	-	-	-
	4	White	12,918	.83	-	-	-
		Nonwhite	504	.30	-	-	-
	5	White	57,780	3.86	34,204	1.99	1.00
		Nonwhite	4,072	2.67	2,429	1.42	1.00
	6	White	98,304	6.78	43,095	2.39	1.00
		Nonwhite	7,001	5.05	4,758	3.05	1.00
All		White	2,572,035	174.04	2,258,282	130.10	1.00
		Nonwhite	264,108	184.28	228,561	139.80	1.00
48201 Harris, TX (Houston)	1	White	391	6.1	321	4.3	0.80
		Nonwhite	160	10.0	94	5.4	1.18

(continued)

Table 12 (cont'd)

State and County Code (City)	Cancer ^a Type	Race	Sex					
			Male			Female		
			Total Deaths Per 20 Years	Death Rate ^b	Relative ^c Rate	Total Death Per 20 Years	Death Rate ^b	Relative ^c Rate
48339 Montgomery, TX (Houston)	2	White	3,684	53.5	1.41	713	8.8	1.40
		Nonwhite	726	44.4	1.21	123	7.0	1.12
	3	White	939	18.9	1.06	-	-	-
		Nonwhite	388	30.1	1.10	-	-	-
	4	White	78	0.8	0.96	-	-	-
		Nonwhite	3	0.2	0.7	-	-	-
	5	White	255	3.7	0.96	165	2.1	1.06
		Nonwhite	64	3.6	1.35	28	1.4	0.99
	6	White	408	7.4	1.09	169	2.3	0.90
		Nonwhite	109	7.4	1.47	53	3.1	1.02
	All	White	12,286	188.5	1.08	10,014	124.2	0.95
		Nonwhite	3,183	203.8	1.11	2,553	139.5	1.00
1	White	22	8.6	1.67	7	2.9	0.54	
	Nonwhite	3	5.0	0.72	3	5.3	1.15	
2	White	117	46.1	1.21	14	5.6	0.89	
	Nonwhite	25	41.9	1.14	3	5.1	0.81	
3	White	43	18.5	1.04	-	-	-	
	Nonwhite	15	23.8	0.87	-	-	-	

(continued)

Table 12 (cont'd)

State and County Code (City)	Cancer ^a Type	Race	Sex					
			Male			Female		
			Total Deaths Per 20 Years	Death Rate ^b	Relative ^c Rate	Total Death Per 20 Years	Death Rate ^b	Relative ^c Rate
51	4	White	1	0.4	0.5	-	-	-
		Nonwhite	-	-	-	-	-	-
	5	White	4	1.7	0.44	3	1.2	0.60
		Nonwhite	3	5.4	2.02	-	-	-
	6	White	12	4.7	0.69	9	3.6	1.51
		Nonwhite	7	11.1	2.20	2	2.8	0.92
	All	White	376	151.5	0.87	234	94.5	0.73
		Nonwhite	45	157.5	0.85	38	107.3	0.77
	1	White	536	6.7	1.30	551	5.4	1.01
		Nonwhite	69	6.4	0.93	48	3.9	0.86
34013 Essex, NJ (Newark)	2	White	3,697	44.7	1.18	712	7.2	1.14
		Nonwhite	547	48.1	1.31	107	7.6	1.21
	3	White	1,381	19.0	1.07	-	-	-
		Nonwhite	229	27.5	1.00	-	-	-
	4	White	69	0.9	1.1	-	-	-
		Nonwhite	7	0.6	2.0	-	-	-
	5	White	366	4.5	1.17	204	2.1	1.06
		Nonwhite	33	2.9	1.09	30	1.9	1.34

(continued)

Table 12 (cont'd)

State and County Code (City)	Cancer ^a Type	Race	Sex					
			Male			Female		
			Total Deaths Per 20 Years	Death ^b Rate	Relative ^c Rate	Total Death Per 20 Years	Death ^b Rate	Relative ^c Rate
34039 Union, NJ (Elizabeth)	6	White	829	10.9	1.61	272	2.6	1.09
		Nonwhite	57	5.6	1.11	50	4.3	1.41
	All	White	16,975	215.1	1.24	15,258	154.5	1.19
		Nonwhite	2,385	219.2	1.19	2,155	154.6	1.11
	1	White	235	5.8	1.12	295	5.8	1.09
		Nonwhite	16	6.1	0.88	23	7.0	1.53
	2	White	1,811	42.0	1.11	354	6.9	1.10
		Nonwhite	123	48.8	1.33	29	10.1	1.61
	3	White	682	19.3	1.08	-	-	-
		Nonwhite	76	39.0	1.42	-	-	-
	4	White	38	0.8	1.0	-	-	-
		Nonwhite	3	0.7	2.3	-	-	-
	5	White	218	5.2	1.35	114	2.3	1.16
		Nonwhite	15	5.3	1.97	9	2.7	1.90
	6	White	369	9.9	1.46	141	2.8	1.17
		Nonwhite	10	4.7	0.93	15	4.8	1.57

(continued)

Table 12 (cont'd)

State and County Code (City)	Cancer ^a Type	Race	Sex					
			Male			Female		
			Total Deaths Per 20 Years	Death ^b Rate	Relative ^c Rate	Total Death Per 20 Years	Death ^b Rate	Relative ^c Rate
22071 Orleans, LA (New Orleans)	All	White Nonwhite	8,311 620	203.4 252.2	1.17 1.37	7,757 534	151.6 166.3	1.17 1.19
	1	White Nonwhite	220	6.3	1.22	201	4.1	0.77
	2	White Nonwhite	2,371 1,006	64.1 60.7	1.69 1.66	376 179	7.8 8.7	1.24 1.39
	3	White Nonwhite	579 454	18.9 32.3	1.06 1.18	- -	- -	- -
	4	White Nonwhite	34 2	0.9 0.1	1.08 0.3	- -	- -	- -
	5	White Nonwhite	168 51	4.6 2.9	1.19 1.07	90 41	1.9 1.9	0.95 1.34
	6	White Nonwhite	319 129	9.8 8.7	1.45 1.72	146 103	2.9 5.3	1.21 1.74

(continued)

Table 12 (cont'd)

State and County Code (City)	Cancer ^a Type	Race	Sex					
			Male			Female		
			Total Deaths Per 20 Years	Death Rate ^b	Relative ^c Rate	Total Death Per 20 Years	Death Rate ^b	Relative ^c Rate
All		White	8,084	230.0	1.32	6,570	135.6	1.04
		Nonwhite	4,072	255.9	1.39	3,586	175.7	1.27

^aCode for Cancer Types: 1 = liver; 2 = trachea, lung, bronchi, etc.; 3 = prostate; 4 = testis; 5 = kidney; 6 = bladder and other urinary organs; All = all malignant neoplasma.

^bDeath Rate is the average annual age - adjusted mortality rate per 100,000 calculated for the 20-year period.

^cRelative Rate is the County death rate divided by the national death rate for a cancer site.

(treated wood products). The presence of these and other industrial companies provide for the manufacture, use or storage of a wide variety of halogenated compounds.

Previous characterization efforts conducted under this contract for ambient air in Houston⁽⁴⁾ have demonstrated the presence of a large number of halogenated compounds. An expanded study was conducted to include other geographical sites in order to further validate the polypollutant analysis method and to determine the composition of ambient air which may play an important role in determining the incidence of cancer in the future. Cancer statistics⁽¹⁶⁾ (Table 12) indicate that Houston has had a high incidence of malignant neoplasms in the past, especially of the liver, lung and bladder.

Baton Rouge, LA has been selected as a study area due to its large industrial activity along the Mississippi River.⁽¹⁹⁾ Table 13 presents the industrial complexes located in or near Geismar, LA.⁽²⁰⁾ The large number of chemical compounds produced here is ideal for validating the polypollutant analysis method. Chemicals such as glycols, anilines, nitro-compounds, and cyanates as well as halogenated compounds are produced here. Table 14 presents some potential chlorinated hydrocarbon emissions from industries in the Iberville/Ascension Parish area.⁽²⁰⁾

In northeast New Jersey a high density of chemical industry⁽²¹⁾ is found, much of which involves halogenated hydrocarbons. The statistics for cancer in two counties of northeast New Jersey (Table 12) are alarming. These counties have uniformly high cancer rates. The overall rate for all malignant neoplasms is significantly above the national average. The cancer incidence in New Jersey has been associated with the chemical and allied industries located there.^(16,17) Because New Jersey represents a metropolitan area with a longtime chemical industry, known environmental levels of halogenated organics and abnormally high cancer rates, this area was selected for examination of the volatile organic vapors in ambient air under this program. One of the principal areas examined was in Edison, NJ where a large chemical disposal site was in operation.

Table 13. CHEMICAL PRODUCTION IN GEISMAR, LA

Company	Chemical	Production (mmlb/yr)	Raw Material
Borden Chemical	Acetic acid	115	CO, Methanol
	Methanol	160	Methane
	Urea	440	Ammonia, CO ₂
	Vinyl acetate	150	Acetic acid, acetylene
Monochem, Inc.	Acetylene	180	Ethylene
	Vinyl chloride	240	Acetylene
Uniroyal	p-Tert-butyl-cresol	4.0	p-Cresol isobutylene
	Maleic Hydrazide	N.A.	N.A.
Rubicon Chemicals, Inc.	Aniline	60	Nitrobenzene
	Dinitrotoluene	N.A.	Toluene
	Methylene Dianiline	N.A.	Aniline
	Methylene Diphenyl	N.A.	-
	Nitrobenzene	52	Benzene
	Phosgene	152	CO, Cl ₂
	Toluene-2,4-Diamine	N.A.	Dinitrotoluene
	Toluene Diisocyanates	40	Toluene 2-4 dia- mine,
	Diphenyl Amine	N.A.	Phosgene Formaldehyde, aniline

(continued)

Table 13 (cont'd)

Company	Chemical	Production (mmlb/yr)	Raw Material
BASF Wyandotte Corp.	Diethylene Glycol	21	Ethylene oxide
	Ethylene Glycol	160	ethylene glycol
	Ethylene Oxide	248	Ethylene oxide
	Phosgene	55	Ethylene
	Propylene	N.A.	CO, Cl ₂
Shell Oil Co.	2,4-Toluene Diisocyanate	100	Ethylene
			Dinitrotoluene
	Diethylene Glycol	9	Ethylene oxide,
			ethylene glycol
	Diethylene Glycol Monobutyl Ether	-	Butanol,
			Ethylene oxide
	Diethylene Glycol Monobutyl Ether	N.A.	Ethanol,
	ether		Ethylene oxide
	Diethylene Glycol Monomethyl Ether	-	Methanol,
			Ethylene oxide
Vulcan Materials Co.	Ethylene Glycol	80	Ethylene oxide
	Ethylene Glycol Monobutyl Ether	-	Ethylene oxide
			Butanol,
	Ethylene Glycol Monoethyl Ether	N.A.	Ethylene Oxide
			Ethanol,
			Ethylene oxide
	Acetaldehyde	N.A.	
	Carbon Tetrachloride	72	
	Ethylene Dichloride	276	Ethylene
	Methyl Chloroform	50	Methanol
	Methylene Chloride	80	Methanol
	Perchloroethylene	150	Propane, Ethane
	Vinylidene Chloride	N.A.	

Table 14. POTENTIAL CHLORINATED HYDROCARBON EMISSIONS FROM
INDUSTRIES IN IBERVILLE-ASCENSION PARISH AREA
IN LOUISIANA

Company	Chemical
Cosmar	none reported
Allied Chemical	none reported
Uniroyal	Cl ₂
Rubicon	<u>o</u> -Dichlorobenzene Propylene Dichloride
Vulcan	Ethylene Dichloride Ethyl chloride Other Chlorinated compounds
Borden Chemical	none reported
Monochem	2-Chloroprene
Shell Chemical	none reported
BASF Wyandotte	Cl ₂
Morton Chemical	HCl

EXPERIMENTAL

Sampling Techniques

The sampling procedure employed has previously been described:⁽⁴⁾ hazardous vapors and other organic compounds are concentrated on a 1.5 x 6.0 cm bed of Tenax GC (35/60) in a glass cartridge. The sorbent was cleaned by extracting with acetone for a period of 18 hr in a Soxhlet apparatus, followed by an additional 18 hrs of extraction with n-hexane. The Tenax GC sorbent was then heated to 100° in a vacuum oven (12" water) for a period of 2 hrs to remove residual solvent. The solid sorbent was then meshed into a 35/60 fraction and packed into glass cartridges using silanized glass wool as support. All cartridges were preconditioned by heating to 275°C for a period of 20 min under a helium purge of 20-30 ml/min. After cooling in precleaned Kimax[®] culture tubes, the containers were sealed to prevent recontamination of the sorbent material. The Kimax[®] culture tubes containing the cartridges were then placed into a sealed metal container until ready for use. Sampling cartridges were carried by either air freight or automobile to the sampling site and 2-3 cartridges were designated as blanks to determine whether any of the cartridges might be contaminated by the packing and transportation procedure.

Ambient air samples which were collected over a 2-3 hr period were collected with a Nutech Model 221-A AC/DC portable sampler.^(4,8) A portable sampling head (Pifer Industries, Durham, NC), fabricated as shown in Figure 5, housed the dual sampling cartridge train. In general, when using the Nutech sampler, a sampling rate of 1-2 l/min/cartridge was used throughout the program. When an integrated sampling period of 24 hrs was required, E. I. DuPont deNemours personnel samplers were used and were housed in the sampling compartment (Fig. 5). A 6 V lantern battery equipped with a step-down transformer (to 5 V) was used for supplying power to the personnel samplers and allowed continuous operations for upto 7 days. Critical orifices (hypodermic needles, gauge No. 23) were used to balance the flow rate through each branch of the sampling train. A sampling rate of ~100 ml/min/cartridge was achieved with the DuPont personnel samplers.

Meteorological conditions were recorded with hand held instruments. The wind direction, velocity, temperature and humidity were all determined. Wind direction was determined using a lensatic compass. The compass was

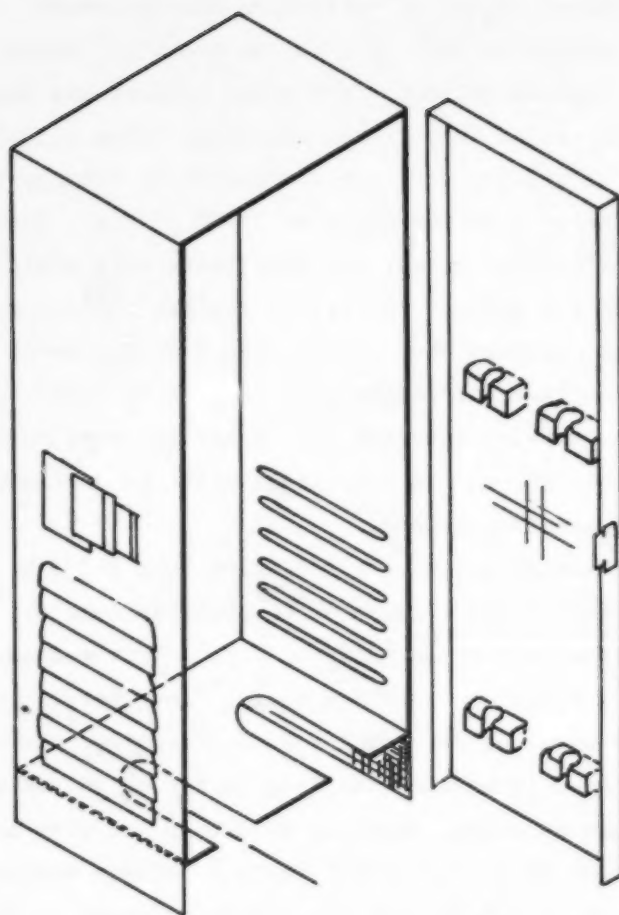


Figure 5. Sampling head for housing cartridge sampling train.

also used to describe the sampling location relative to major industrial facilities. Wind velocity was estimated with a Dwyer wind meter (Dwyer Instruments Inc., Michigan City, IN). A hand held rotometer with two scales (2-10 mph and 4-66 mph capability) was held. Barometric pressure was measured with a Pocket Altimeter (Gischard, West Germany). This aneroid barometer was compared with a mercury barometer and found to read to 0.1" of mercury high. It was calibrated from 19-31" of mercury and 0-13,000 ft of altitude. Air temperature and relative humidity were determined with a sling psychrometer (Taylor Instruments Co., Rochester, NY). Precipitation was measured volumetrically with a Nimbus Model 609-B rain gauge (Air Guide Instruments Co., Chicago, IL). At one sampling location, a Meteorological Research Inc. (MRI) weather station was assembled. The weather station was positioned approximately 2 meters above ground and possessed the capability of continuous recording of wind velocity, wind direction, temperature and humidity. The hand held instrumentation was used to determine the meteorological conditions at the various locations at different times throughout the sampling period, while the MRI instrument provided continuous weather data from only one location. In addition, surface weather conditions were obtained from the local airports to supplement the meteorological data for the area sampled.

Determining distances from a suspected point source of pollution or the location of sampling was estimated with a Rangematic Distance Finder (Ranging Inc., Rochester, NY). The range finder was calibrated for 40-1,000 yds (also with approximations for 1 and 2 mile measurements). It was found to be accurate to $\pm 1\%$ at 100 yds.

The sampling protocols employed for ambient air at the Kin-Buc Disposal Site, Houston, TX and vicinity, and Geismar, LA are given in Tables 15-17. The corresponding sampling locations for each of the sites are depicted in Figures 6-17.

Instrumental Methods of Analysis

The instrumental system (glc/ms/comp) used for the qualitative and quantitative analysis of organic vapors and the inlet-manifold used for recovering vapors trapped on Tenax GC sampling cartridges have been previously described.^(4,7,8,15) The operating parameters for the glc/ms/comp system shown in Figure 18 for the analysis of samples is given in Table 18.

Table 15. SAMPLING PROTOCOL FOR KIN-BUC DISPOSAL SITE

Period	Location	Distance from Site ^a	Sampling Time	Sampling Volume ^b	Meteorological Conditions			
					T(°F)	ZRH	Wind Dir./Speed	in Hg
6/29/76 (P1)	L1 (Tower Marina)	255°/1.65 km	1207-1359	112.5	82	69	255°/2-7 mph	30.19
	L2 (Meadow Rd.)	~345°/0.4 km	1206-1355	134	82	69	240°/3-7 mph	30.19
	L3 (N of Site)	25°/0.41 km	1207-1359	156	82	69	240°/3-7 mph	30.19
	L4 (N of Site)	35°/0.29 km	1207-1359	140	82	69	210-255°/2-8 mph	30.19
(P2)	L1 (Tower Marina)	255°/1.65 km	1607-1737	111.4	86	57	270°/2-7 mph	30.18
	L2 (Meadow Rd.)	~345°/0.36 km	1607-1737	175	86	57	220-240°/0-3 mph	30.18
	L3 (E of Site)	40°/0.18 km	1607-1737	183.4	86	57	-	30.18
	L4 (E of Site)	35°/0.22 km	1607-1737	187.2	86	57	245°/0-2 mph	30.18
6/30/76 (P3)	L1 (Sayreville)	2.01 km ESE from site	1029-1229	138.5	82	76	70°/2-7 mph	30.12
	L2 (Meadow Rd.)	45 m downwind of chemical plant	1030-1230	187.5	82	76	100-140°/2-7 mph	30.12
	L3 (Meadow Rd.)	350°/0.46 km	1029-1229	175.9	82	76	-	30.12
	L4 (W of Site)	305°/0.34 km	1029-1229	191.2	82	76	95-120°/5-9 mph	30.12

(continued)

Table 15 (cont'd)

Period	Location	Distance from Site ^a	Sampling Time	Sampling Volume ^b	Meteorological Conditions		
					T (°F)	%RH	Wind Dir./Speed in Hg
(P4)	L1 (Tower Marina)	255°/1.65 km	1457-1646	117.7	88	57	180+200°/ 5-12, 20- 35, 10-20
	L2 (Meadow Rd.)	21 m from chemical plant	1458-1646	248	88	57	190°/5-15 mph
	L3 (N of Site)	0°/0.73	1457-1646	200.3	88	57	190°/5-20 mph
	L4 (NE, then N of site) ^c	25°/0.41 km 345°/0.91 km	1457-1528 1537-1648	0.104 0.269	88	57	180+200°/ 5-35 mph
	L1 (Tower Marina)	255°/1.65 km	1006-1206	114.4	79	57	270°/5-9 mph
93	L2 (Meadow Rd.)	~76 m from chemical plant	1006-1206	204.2	79	57	230-260°/ 4-12 mph
	L3 (On-Site)	-	1015-1038	19.8	79	57	260°/4-9 mph
	L4 (E of Site)	40°/0.18 km	1006-1206	230	79	57	230-250°/ 4-12 mph
	L1 (Tower Marina)	255°/1.65 km	1425-1625	120	84	43	270°/2-5 mph
(P6)	L2 (Meadow Rd.)	345°/0.36 km	1425-1625	181	84	43	230-260°/ 2-5 mph
	L3 (On-Site)	-	1444-1458	19.8	84	43	230-260°/ 2-5 mph

(continued)

Table 15 (cont'd)

Period	Location	Distance from Site ^a	Sampling Time	Sampling Volume ^b	Meteorological Conditions		
					T(°F)	%RH	Wind Dir./Speed in Hg
L4 (E of Site)		40°/0.18 km	1425-1625	208.4	84	43	230-260°/ 2-8 mph

^aApproximate magnetic bearing and distances relative to Kin-Buc.

^bVolume in liters.

^cSampler was moved to new site during sampling period.

Table 16. AMBIENT AIR SAMPLING PROTOCOL FOR HOUSTON, TX AND VICINITY

Site	Sampling Location	Sampling Time (min)	Volume Sampled (ℓ)	Remarks
Houston, TX	Milby Park (HL1)	1670-1750	188	7/27/76 93°F 60% RH 160°/3 mph
Houston, TX	Off Goodyear Rd. on unpaved St. (HL2)	1510-1515	37	7/27/76 93°F 60% RH 160°/3 mph
Houston, TX	Steelman Ave. & E1 Buey Way (HL3)	1620-1750	229	7/27/76 93°F 60% RH 160°/3 mph
Pasadena, TX	Between Industrial Site and Ship Channel (HL3)	1430-1600	185	7/28/76 89°F 65% RH 160°/5-10 mph
Pasadena, TX	Tenneco Property (PL2)	1430-1600	237	7/28/76 89°F 65% RH 160°/5-10 mph
Pasadena, TX	Tenneco Property (PL3)	1430-1600	191	7/28/76 89°F 65% RH 160°/5-10 mph
Deer Park, TX	Shell Property (DSL1)	1100-1200	122	7/29/76 87°F 66% RH 180°/4-9 mph
Deer Park, TX	Shell Property (DSL2)	1100-1200	136	7/29/76 87°F 66% RH 180°/4-9 mph
Deer Park, TX	Diamond Shamrock Property (DDL1)	1455-1555	137	7/29/76 94°F 54% RH 130°/4-7 mph
Deer Park, TX	Off Tidal Road (DTL1)	1020-1035	113	7/30/76 90°F 50% RH 210°/6 mph

(continued)

Table 16 (cont'd)

Site	Sampling Location	Sampling Time (min)	Volume Sampled (g)	Remarks
Deer Park, TX	Off Tidal Road (DTL2)	1115-1215	147	7/30/76 90°F 60% RH 200°/6-8 mph
Deer Park, TX	Off Tidal Road (DTL3)	1455-1555	162	7/29/76 87°F 60% RH 180°/4-9 mph
Deer Park, TX	Off Tidal Road (DTL4)	1115-1215	165	7/30/76 90°F 60% RH 200°/6-8 mph
Freeport, TX	On Dow Chem. Property (FL1)	1342-1543	116	8/9/76 90°F 65% RH 145°/5-10 mph
Freeport, TX	On Dow Chem. Property (FL2)	1348-1555	85	8/9/76 90°F 65% RH 145°/5-10 mph
Freeport, TX	On Dow Chem. Property (FL3)	1425-1508	79	8/9/76 90°F 65% RH 145°/5-10 mph
La Porte, TX	On E. I. DuPont de Nemours & Co. Property (LL1)	1645-1833	110	8/12/76 90°F 62% RH 130-150°/2-6 mph
La Porte, TX	On E. I. DuPont de Nemours & Co. Property (LL2)	1641-1824	82	8/12/76 90°F 62% RH 130-150°/2-6 mph
La Porte, TX	On E. I. DuPont de Nemours & Co. Property (LL3)	1114-1252	87	8/13/76 92°F 53% RH 240°/0-4 mph

Table 17. AMBIENT AIR SAMPLING PROTOCOL FOR GEISMAR, LA AREA

Sampling Location	Sampling Time (min)	Volume Sampled (L)	Remarks
Corner of highway 73 and 75 (L12)	1398	140	2/28-3/1/77 62°F 28+85% RH 290+240°/9 kts
Southeast of Plant R (L13)	1400	140	2/28-3/1/77 62°F 28+85% RH 290+240°/9 kts
North of Plant M (L14)	260	180	3/1/77 63°F 85% RH 180°/light
Northeast of Plant M and N (L15)	25	142	3/1/77 63°F 85% RH 180°/light
Northwest of Plant M off LA 73 (L14)	1205	120	3/1-3/2/77 65°F 52% RH 120°/light
Southwest of Plant M off LA 73 (L16)	135	91	3/2/77 65°F 52% RH 120°/light

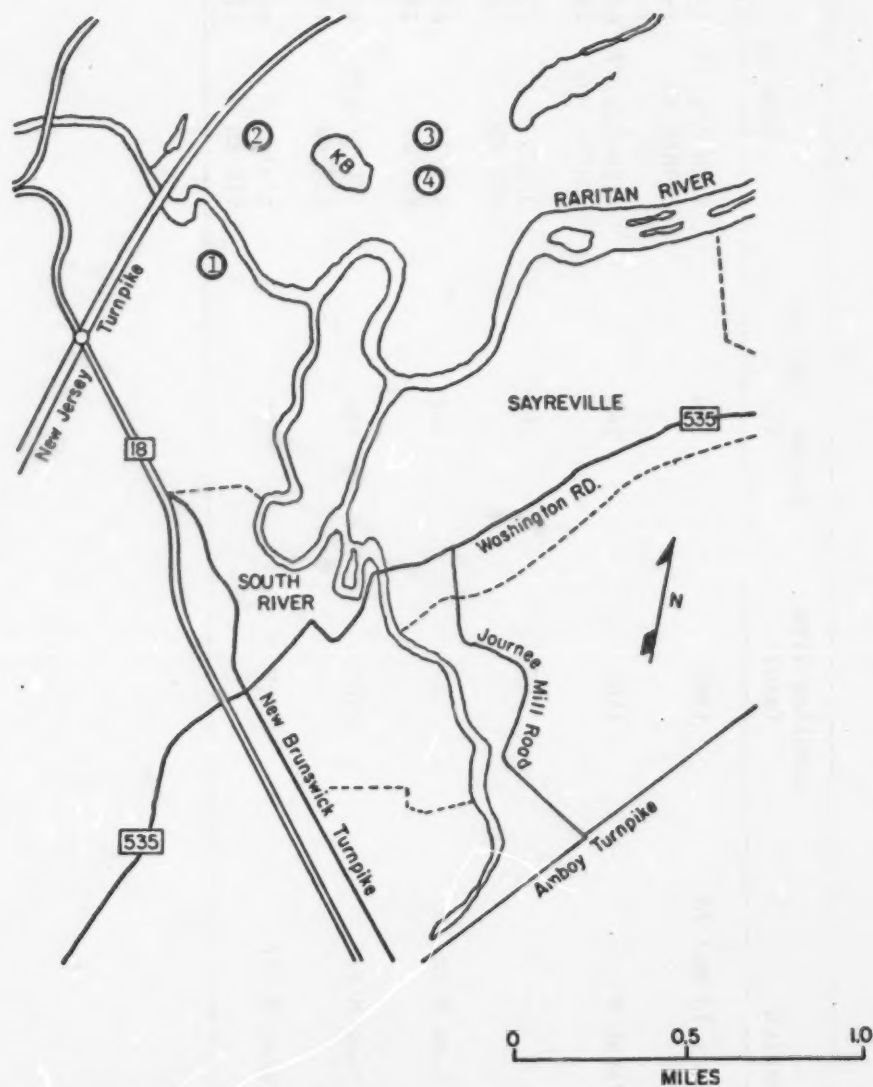


Figure 6. Sampling locations surrounding Kin-Buc Land-fill, Edison, NJ (Table 15, Period 1).



Figure 7. Sampling locations surrounding Kin-Buc Land-fill, Edison, NJ (Table 15, Period 2).

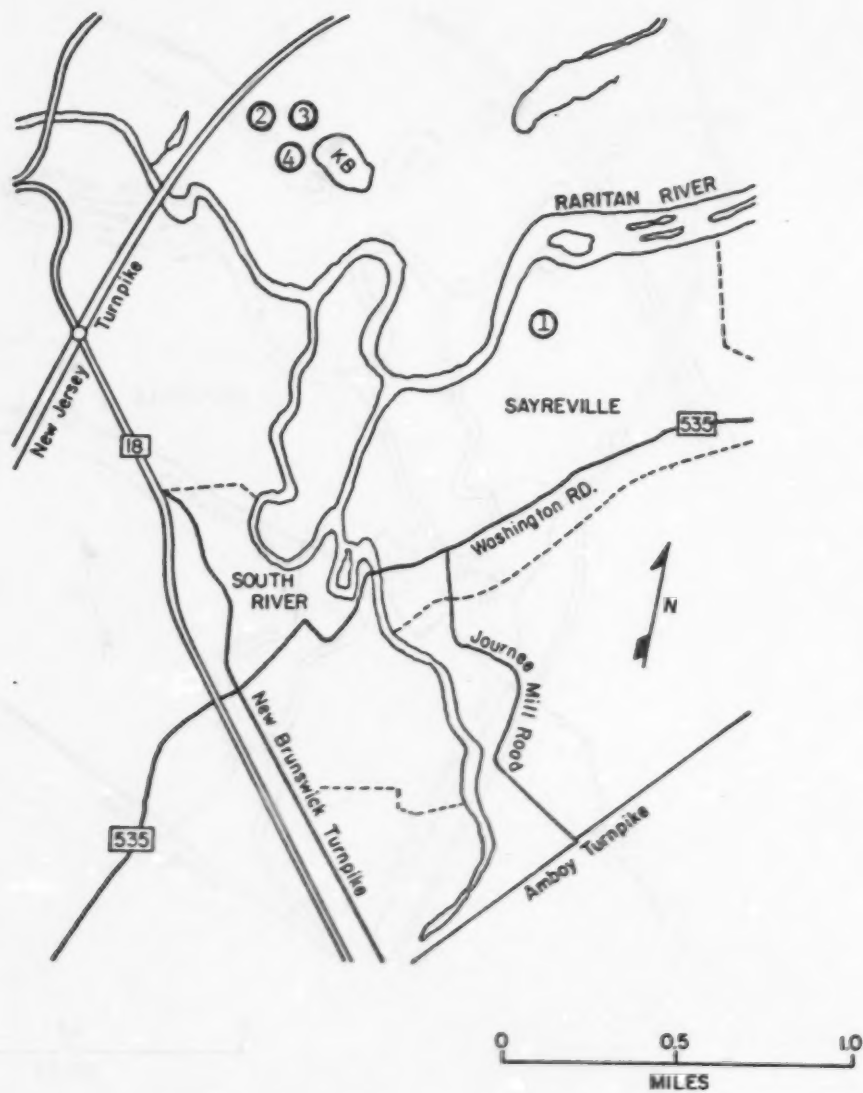


Figure 8. Sampling locations surrounding Kin-Buc Land-fill, Edison, NJ (Table 15, Period 3).



Figure 9. Sampling locations surrounding Kin-Buc Land-fill, Edison, NJ (Table 15, Period 4).



Figure 10. Sampling locations surrounding Kin-Buc Land-fill, Edison, NJ
(Table 15, Period 5).



Figure 11. Sampling locations surrounding Kin-Buc Land-fill, Edison, NJ
(Table 15, Period 6).

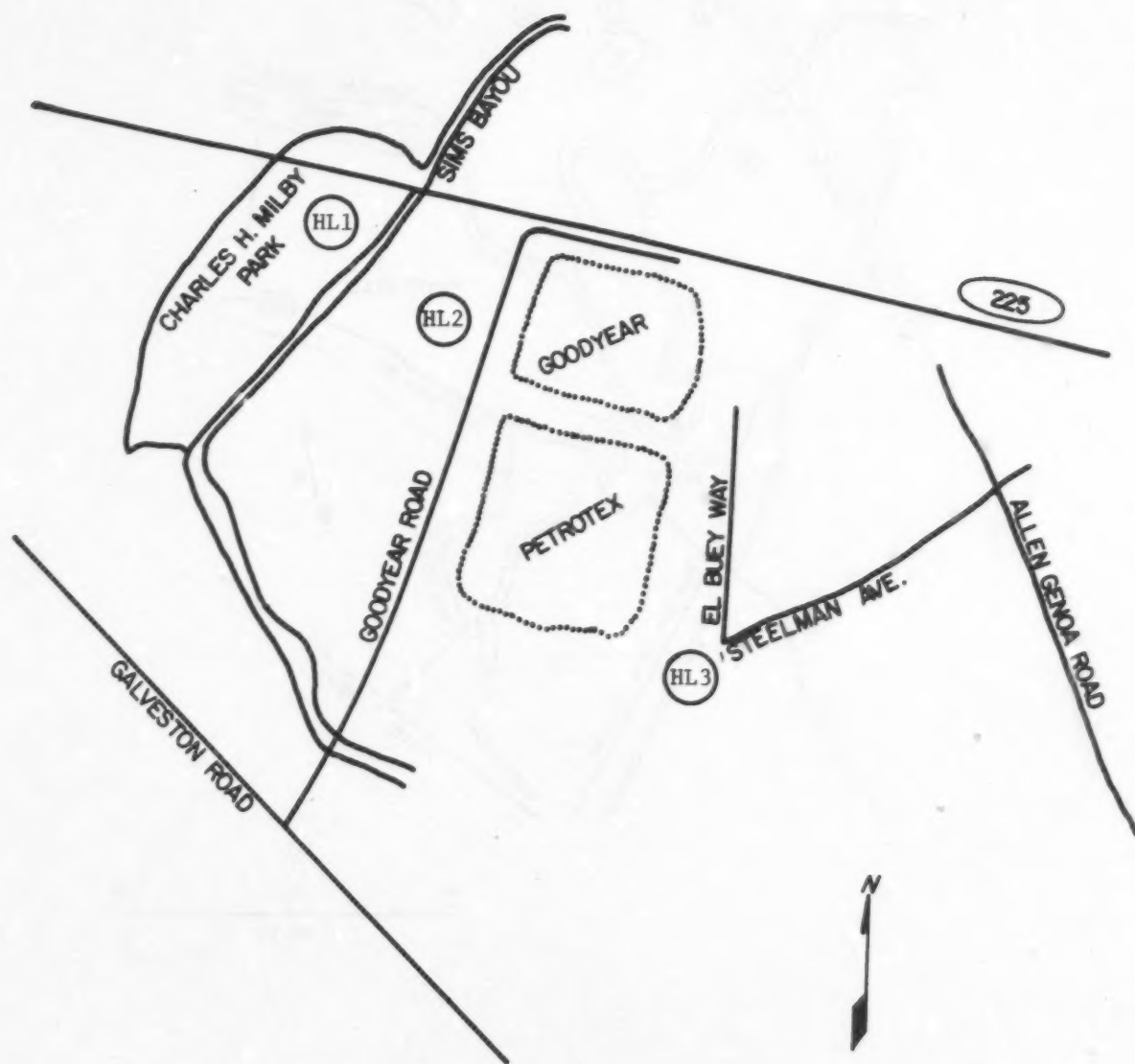


Figure 12. Sampling locations for Houston, TX site

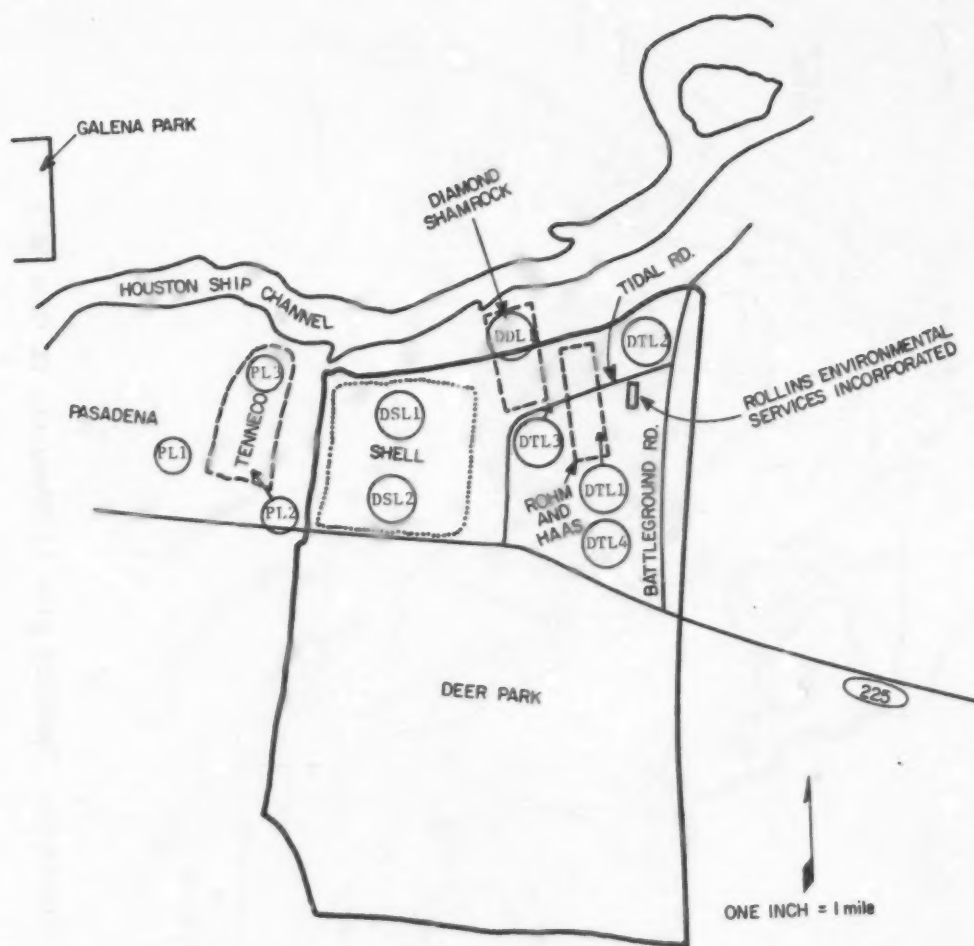


Figure 13. Sampling locations for Deer Park and Pasadena, TX sites.

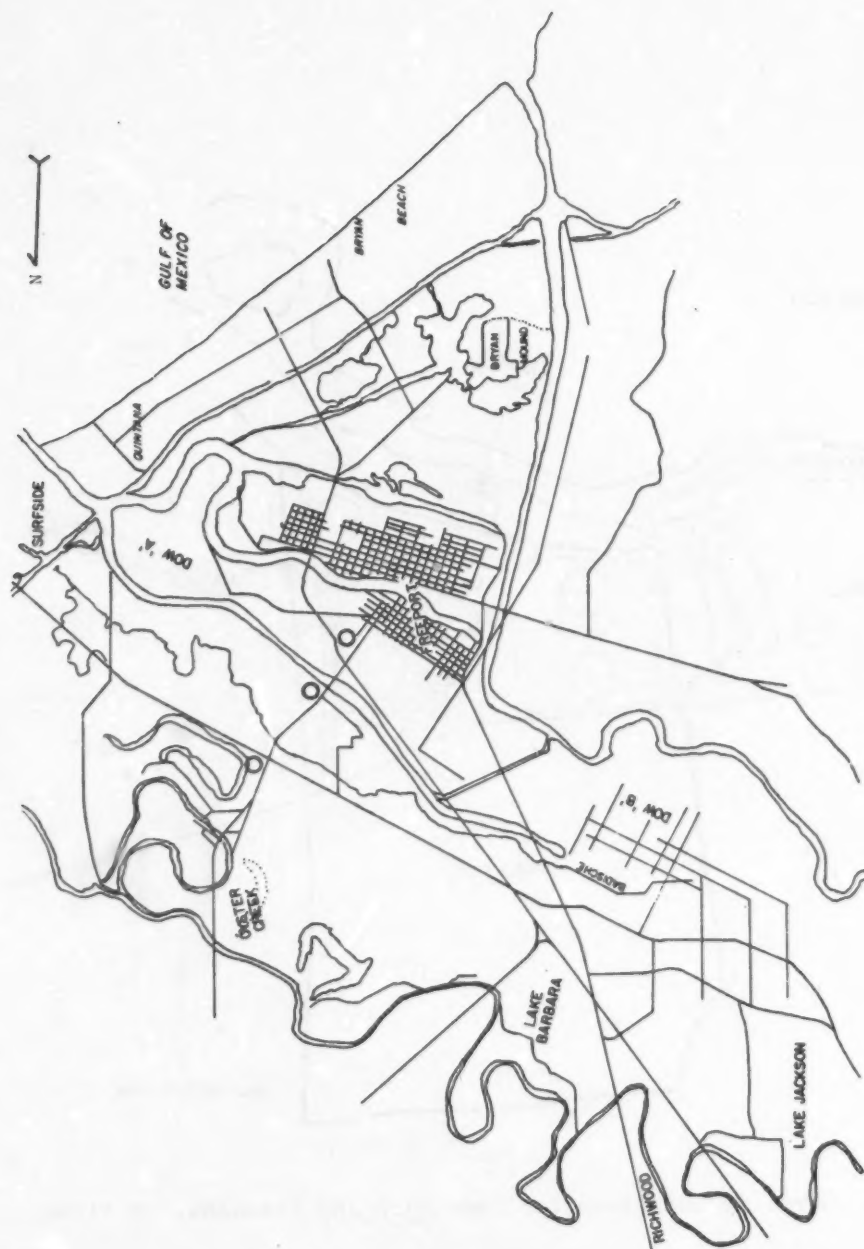


Figure 14. Sampling site in Freeport, TX (Dow 'A').



Figure 15. Sampling locations in Freeport, TX (Dow 'A').

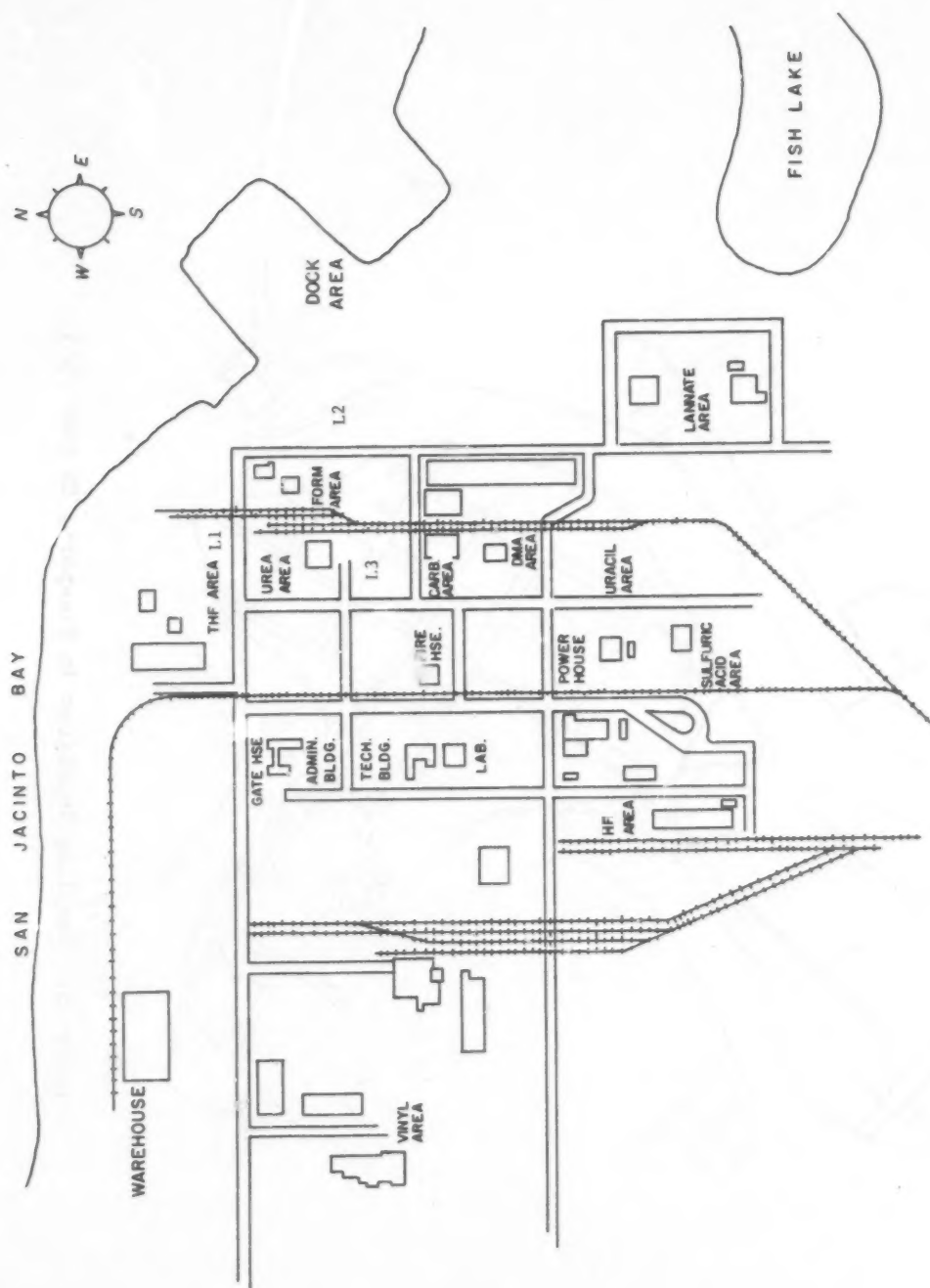


Figure 16. Sampling site and locations in La Porte, TX (E. I. DuPont de Nemours & Co.).

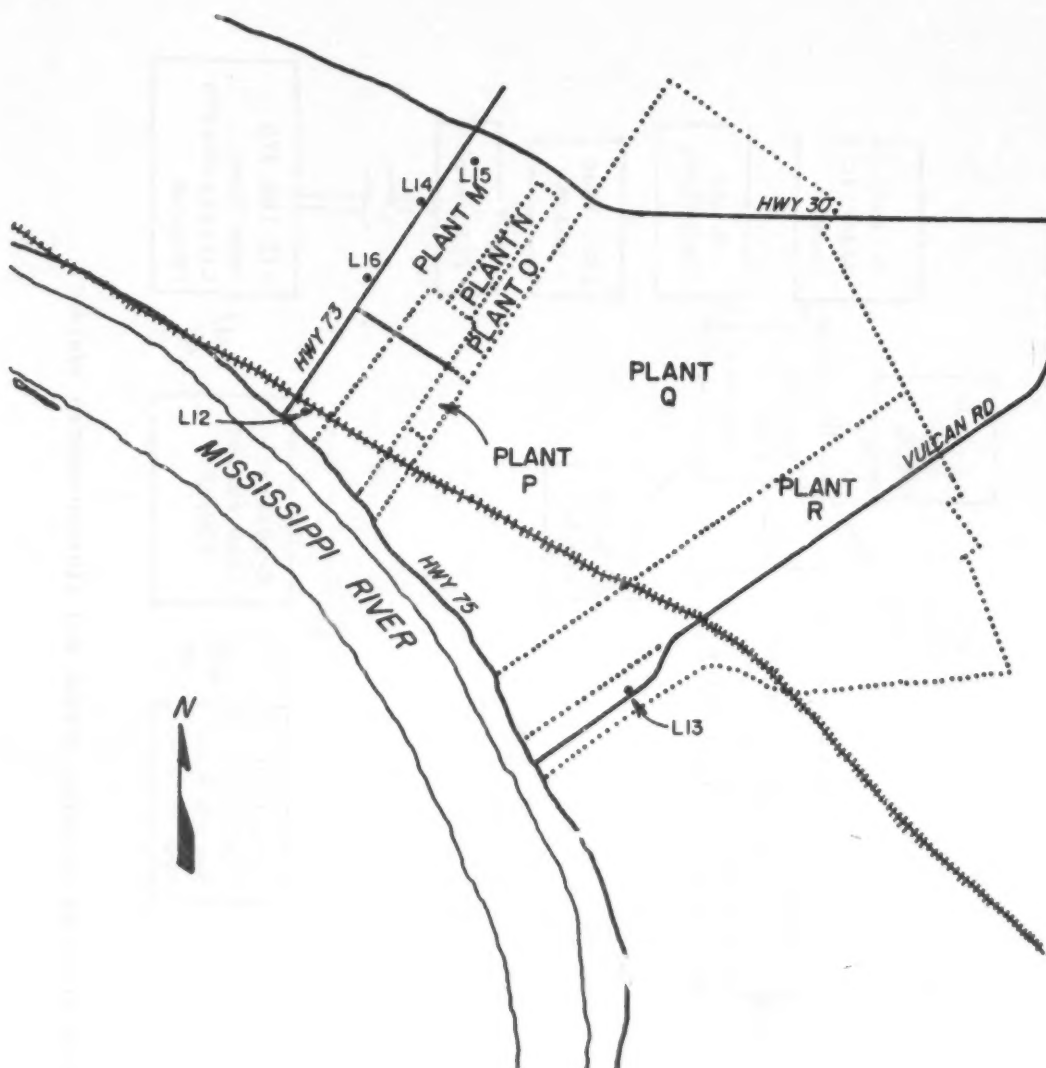


Figure 17. Sampling site and locations in Geismar, LA area.
M = Borden Chemical Co., N = Monochem, Inc., O =
Uniroyal Inc., P - Rubicon Chemical, Inc., Q = BASF
Wyandotte Chemical Corp., R = Shell Chemical Co.,
S = Vulcan Materials, Inc.

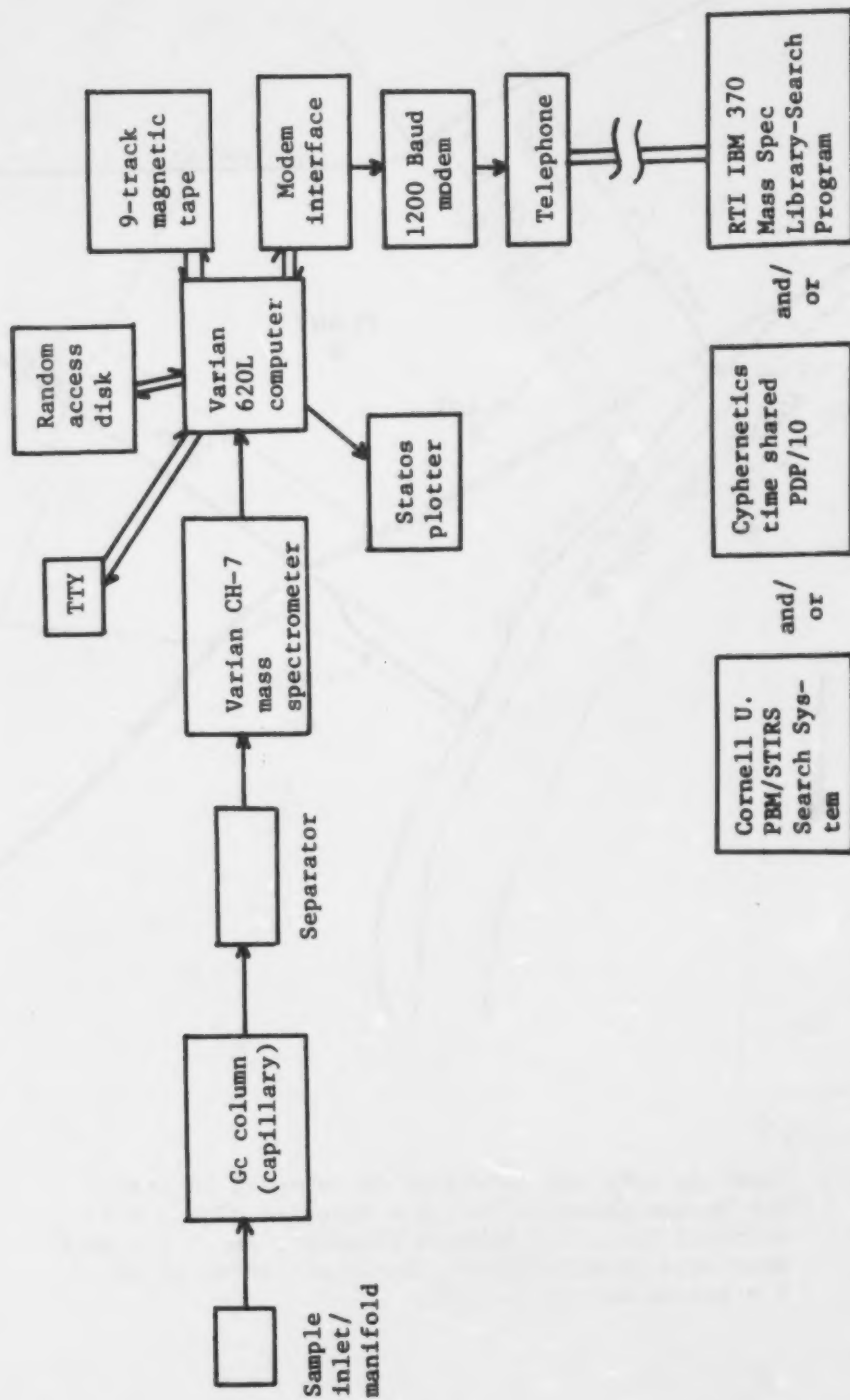


Figure 18. Schematic diagram of gc-ms computer system and library search systems.

Table 18. OPERATING PARAMETERS FOR GLC-MS-COMP SYSTEM

Parameter	Setting
Inlet-manifold	
desorption chamber	270°C
valve	220°C
capillary trap - minimum	-195°C
maximum	220°C
thermal desorption time	4 min
GLC	
100 m glass SCOT OV-101	20-240°C, 4/C° min
50 m glass SCOT Carbowax 20M	80-240°C
carrier (He) flow	~3 ml/min
transfer line to ms	240°C
MS	
scan range	<u>m/e</u> 20 → 300
scan rate, automatic-cyclic	1 sec/decade
filament current	300 μA
ion source vacuum	~4 x 10 ⁻⁶ torr

Samples were analyzed on a 100 m glass SCOT capillary coated with OV-101 stationary phase and/or a 50 m glass SCOT coated with Carbowax 20M. The desorption of vapors from the Tenax sampling cartridges was achieved at 270°C. A single stage glass jet separator which interfaced a SCOT capillary column to the mass spectrometer was maintained at 240°C. The capillary column was programmed from 20-240°C at 4°/min for the OV-101 and from 80-240°C at 4°/min for the Carbowax 20M.

Methods of Identification

Identification of the constituents in the samples was established by comparing the mass cracking pattern of the unknown mass spectra to an Eight Peak Index⁽²²⁾ and to the Wiley collection.⁽²³⁾ In many cases, the identification was confirmed by comparing the mass cracking pattern of an authentic compound run under identical conditions with that of the unknown. The elution temperatures were also compared based on the chromatography of the authentic compound under identical conditions to the unknown. In some cases, the identification was achieved using the RTI computer based mass spectral search system and/or the PBM/STIRS system located at Cornell University.

Quantitative Analysis

Utilizing either the total ion current monitor when the constituents were adequately resolved or, when necessary, the use of mass fragmentograms, the concentration of each substance was determined. In order to eliminate the need to obtain complete calibration curves for each compound for which quantitative information was desired, we used the method of relative molar response (RMR) factors. This technique has previously been reported.⁽¹⁵⁾ The mass cracking ions for a number of selected compounds for quantification by mass fragmentography are shown in Table 19.

RESULTS AND DISCUSSION

Kin-Buc Disposal Site, Edison, NJ

The sampling protocol employed for the collection of pollutants in ambient air surrounding the Kin-Buc disposal area was given in Table 15. The general strategy was conducted so that four locations were selected around the disposal site which constituted upwind, downwind and crosswind directions from the dump site (Figs. 6-11). Furthermore, one location was between Stauffer Chemical Co. and the Kin-Buc disposal site with an eye

Table 19. MASS CRACKING IONS SELECTED FOR
QUANTIFICATION BY MASS FRAGMENTOGRAPHY

Chemical Class	Ion (Intensity)		
	1st	2nd	3rd
HALOGENATED HYDROCARBONS			
chloroprene	88 (50)	90 (17)	53 (100)
1,2-dichloroethane	62 (100)	64 (32)	49 (51)
1,1,1-trichloroethane	117 (19)	119 (18)	61 (59)
carbon tetrachloride	117 (100)	121 (30)	47 (41)
trichloroethylene	130 (99)	132 (95)	95 (100)
dichlorobutene	75 (100)	89 (43)	53 (50)
tetrachloroethylene	166 (100)	168 (49)	129 (63)
dichlorobutane	55 (100)	62 (20)	90 (22)
2,3-dichloropropene			
3,3-dichloropropene-1	110 (20)	75 (100)	49 (20)
1,3-dichloropropene-1			
methylene bromide	172 (52)	174 (100)	93 (72)
1,2-dichloropropane	63 (100)	62 (68)	76 (30)
dibromochloromethane	129 (100)	208 (12)	127 (80)
1,1,1,2-tetrachloroethane	131 (100)	133 (97)	117 (82)
1,1,2,2-tetrachloroethane	168 (18)	166 (13)	83 (100)
bromoform	173 (100)	252 (10)	175 (49)
bis-(2-chloroisopropyl)ether	45 (100)	121 (17)	93 (8)
hexachloro-1,3-butadiene	225 (100)	229 (22)	260 (38)
1,2-dibromopropane	123 (98)	202 (2)	121 (100)
tetrachloropropane isomers	178 (18)	180 (2)	143 (100)
vinylidene chloride	96 (61)	98 (38)	61 (100)
phosgene	63 (100)	65 (32)	44 (40)
1,2,2-trichloropropane	111 (43)	61 (23)	75 (20)
1,1,2-trichloropropane	75 (100)	110 (32)	61 (30)
1,1,-trichloropropane	111 (100)	113 (80)	75 (60)
pentachloroethane	202 (0)	167 (88)	165 (69)
perchloroethane	234 (0)	201 (100)	203 (63)
1,1-dichloropropene			
1,2-dichloropropene	110 (100)	112 (64)	49 (22)
OXYGENATED COMPOUNDS			
isobutyl isobutyrate	89 (20)	-	-
isobutyl <i>n</i> -butyrate	89 (12)	60 (23)	-
isoamyl benzoate	123 (28)	70 (87)	-
dimethyl phthalate	163 (100)	-	-
butyl formate	56 (100)	73 (8)	-

(continued)

Table 19 (cont'd)

Chemical Class	Ion (Intensity)		
	1st	2nd	3rd
methyl methacrylate	69 (83)	100 (51)	-
isobutyl methacrylate	69 (78)	87 (14)	-
n-butyl methacrylate	69 (58)	87 (31)	-
diethyl phthalate	177 (100)	149 (44)	222 (10)
dipropyl phthalate	149 (100)	209 (9)	-
dibutyl phthalate	149 (100)	223 (9)	-

towards distinguishing between pollutants from Stauffer and Kin-Buc. During each sampling period, meteorological conditions were recorded in order to define the wind patterns, temperature and humidity around the sampling site. In particular, the wind direction and speed were determined for documenting the positions as to upwind, downwind, and crosswind of the disposal site. The sampling protocol covered three days with two sampling periods/day. Each sampling period was approximately 2 hrs in duration and a volume of 100-150 l was collected.

In addition to the use of the Tenax GC cartridge for the collection of ambient air pollutants an SKC carbon cartridge was used in tandem for the trapping of vinyl chloride. The SKC cartridge was 1.5 cm i.d. x 4.0 cm in length. The breakthrough volume for vinyl chloride on this material was previously established to be 100 l at 70°F.^(x) Two sets of cartridges were utilized/sampler at the four locations.

In Appendix A, Tables A1-A24 lists the volatile organic compounds which were identified in ambient air surrounding and on the Kin-Buc disposal site. Table 20 summarizes the volatile organics which were identified in terms of chemical classes for each of the six periods and four locations. A total of 28 halogenated compounds was detected in these samples. Approximately 6 of these were detected in practically all of the samples taken around the disposal site area which indicates that these pollutants are ubiquitous and not site-specific. On the other hand, the remaining 22 halogenated compounds which included many chlorinated and brominated organics appeared to be more specific to the sampling site area. Four sulfur compounds were identified (Table 20). These compounds appeared to be unique to the site area and did not represent ubiquitous background pollutants. A total of 10 nitrogen-containing compounds were detected and of these, nine were probably unique to the site area. The tenth one, cyanobenzene, appeared to be a ubiquitously occurring vapor.

Eighty-nine oxygenated compounds were identified. They represented ketones, aldehydes, ethers, esters and alcohols. The presence of many of these oxygenated compounds can be attributed to emissions from the disposal site area. The presence of ethers, alcohols and esters may be considered rather unique to the site since these compounds have not been observed as

Table 20. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR SURROUNDING KIN-BUC DISPOSAL SITE

Chemical Class	Compound	Period 1				Period 2				Period 3				Period 4				Period 5				Period 6			
		L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4
Halogenated Hydrocarbons	dichloromethane	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	chloroform	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1,1,1-trichloroethane	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	carbon tetrachloride	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	trichloroethylene	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	tetrachloroethylene	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	chlorotoluenes (1-3)	-	+	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	benzyl chloride	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	dichlorobenzene (m or p)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	bromotoluene (m or p)	-	+	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	ethyl chloride	-	+	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	chlorobenzene	-	+	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	3-chloropropene	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	1,2-dichloroethane	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	1,2-dibromoethane	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	bromotoluene isomer	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	bromotoluene isomer	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	dichlorotoluene	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	vinylidene chloride (tent.)	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	2-chloropropane (tent.)	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	1-chloro-2-bromoethane	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	1-bromo-2-fluorobenzene	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	benzyl bromide (tent.)	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	methylene dibromide	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	trichlorobenzene isomer	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	1,1,2,2-tetrachloroethane	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	bromoxylene isomer	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+
	chloroxylene	-	-	-	-	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+	-	+	+	+

(continued)

Table 20 (cont'd)

Chemical Class	Compound	Period 1				Period 2				Period 3				Period 4				Period 5				Period 6			
		L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4
Sulfur Compounds	thiophene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	dimethyldisulfide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	propylthiophene (tent.)	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	n-butyl thiophene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Compounds	cyanobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	indole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	N,N-dimethylformamide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	acrylonitrile	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	dimethylhydrazine (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	trimethylamine (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	acetonitrile	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	benzamide (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	dicyanobenzene (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	methylcyanobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxygenated Compounds	acetaldehyde	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	furan	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	propanal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	acetophenone	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2-nonanone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(continued)

Table 20 (cont'd)

Chemical Class	Compound	Period 1				Period 2				Period 3				Period 4				Period 5				Period 6			
		L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4
Oxygenated Compounds (cont'd)	terphtaldehyde	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2- or 3-decanone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	n-decanal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	naphthol isomer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	n-propanol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ethyl acetate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	cyclopentanone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	l-canone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-methyl furan (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	diisopropyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	methyl isopropyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	isopropyl acetate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	n-butyl acetate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	isopropanal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-methylfuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	methyl isobutyl ketone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	n-butylfuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-ethylhexanal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	biphenyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	dimethylfuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	acrolein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	disoethyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	acetone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
methyl-n-propyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
diethyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2-methylpropenal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
vinyl acetate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

(continued)

(continued)

Table 20 (cont'd)

Chemical Class	Compound	Period 1				Period 2				Period 3				Period 4				Period 5				Period 6			
		L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4
Oxygenated Compounds (cont'd)	n-butanol	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	methyl ethyl ketone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	methyl vinyl ketone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	n-pentanol	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2-pentanone	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4-methyl-2-pentanone	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3-methyl-2-pentanone	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	n-hexanol	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2-hexanol	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2-ethylbutyraldehyde	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2-hexanone	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2-heptanone	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	n-heptanol	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	octanone	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	benzaldehyde	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2-octanone	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	phenol	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	n-octanol	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	benzyl methyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	phenethyl alcohol (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
diethylphenol	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
1-butanol	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
2-propyl acetate	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
isobutyl acetate (tent.)	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
2,5-dimethylfuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
vinyl ethyl ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1,2-epoxybutane (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
crotonaldehyde	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
tetrahydrofuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2-n-propenylfuran (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

(continued)

(continued)

Table 20 (cont'd)

Chemical Class	Compound	Period 1				Period 2				Period 3				Period 4				Period 5				Period 6			
		L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4	L1	L2	L3	L4
Oxygenated Compounds (cont'd)	hydroxybenzaldehyde	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	p-cresyl acetate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	o-methoxybenzaldehyde	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	o-methyl anisole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	dipropylene glycol methyl ether (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	di-n-amyphthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	n-butyl formate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	furfuryl alcohol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,3-benzofuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-heptanol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-methyl-2-pentanol (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	dibenzofuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	diethylphthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	benzophenone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	methyl 2-methylallyl ether (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	methyl allyl alcohol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	benzyl acetate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	benzyl benzoate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,3-dioxane (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	trimethylfuran isomer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	dioxane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	tetrahydrofuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	acetic acid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	methyl isopropyl ketone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	p-methyl benzyl alcohol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ubiquitous pollutants in samples taken at many other geographical areas within the Continental U.S.

The compounds which were selected for quantification were primarily those appearing in significant concentrations in or downwind from the Kin-Buc disposal site. In several cases, compounds which were found to be unique in the air collected downwind from the Stauffer Chemical Co. and upwind from the disposal site were also quantified. The levels of organic vapors which were estimated in ambient air surrounding the site are listed in Tables 21-26. Significant concentrations of benzene were detected in each of the sampling periods near the disposal site area. Also, many halogenated hydrocarbons were also represented in these samples.

Analysis of the SKC carbon cartridges which had been taken in tandem with the Tenax GC cartridges indicated that no vinyl chloride was present in concentrations above 16 ppt (Table 27). The samples which were selected for analysis represented downwind locations from the disposal site. Since vinyl chloride was not detected in these samples, the values were expressed in terms of the detection limit of the method. Two samples (P5/L3 and P6/L3) represented samples taken on the dump site. Likewise, these samples did not contain vinyl chloride above 40 ppt. Since these samples did not contain vinyl chloride, the remaining sampling cartridges were not analyzed.

Houston, TX and Vicinity Sites

The ambient air sampling protocol for Houston, TX and vicinity was given in Table 16. A total of five sites was studied. At the first site in Houston, TX, three locations were sampled. These were indicated in Figure 12. Two additional sites were Pasadena and Deer Park, TX. These sites are indicated in Figure 13. The last two sites were in Freeport and La Porte, TX. The sampling locations on Dow Chemical and E. I. Dupont deNemours properties are shown in Figures 14, 15 and 16, respectively.

A principal reason for returning to the first site (Milby Park, Houston, TX) was our previous report of finding chloroprene. The sampling method employed was intended to establish the presence of chloroprene as well as determine the levels in ambient air. The two additional sites, Pasadena and Deer Park, TX were selected because of the many petroleum refineries and chemical industries located in this area as well as the services for the destruction of chemical wastes.

Table 21. CONCENTRATIONS OF ORGANIC VAPORS SURROUNDING KIN-BUC DISPOSAL SITE^a

Compound	Sampling Period/Location ^b			
	P1/L1	P1/L2	P1/L3	P1/L4
acetaldehyde	trace	~10,250	trace	~3,125
acetic acid	ND	ND	~91	trace
acrolein	ND	ND	trace	4,000
allyl acetate	ND	30,697	ND	ND
benzaldehyde	80	trace	trace	trace
benzene	20,343	93,750	9,687	13,406
benzyl methyl ether	ND	1,000	ND	ND
n-butyl acetate	ND	ND	129	4,774
n-butyl butyrate	ND	ND	43	525
carbon tetrachloride	ND	ND	1,312	750
chloroform	6,389	ND	trace	trace
chlorotoluene	ND	2,593	ND	ND
cyanobenzene	ND	ND	trace	1,169
1,2-dichloroethane	ND	ND	ND	217
dimethyl ether	trace	ND	trace	10,500
ethyl phenyl acetate	ND	trace	ND	ND
2-hexanone	ND	ND	trace	ND
3-heptanone	ND	ND	trace	trace

(continued)

Table 21 (cont'd)

Compound	Sampling Period/Location ^b			
	P1/L1	P1/L2	P1/L3	P1/L4
isopropyl ether	ND	ND	trace	trace
methallyl alcohol	ND	800	ND	trace
methylbromobenzene	ND	507	ND	ND
methyl ethyl ketone	trace	ND	1,500	trace
4-methyl-2-pentanone	ND	ND	2,125	5,958
3-methyl-2-pentanone	ND	ND	45	1,140
1-methyl-2-chlorobenzene	ND	1,873	ND	ND
n-nonanal	ND	ND	ND	2,661
tetrachloroethylene	354	1,527	trace	trace
trichloroethylene	trace	210	1,315	10,052
1,1,1-trichloroethane	trace	trace	trace	trace
vinyl acetate	ND	ND	ND	583

^a ng/m³.^b Refer to Table 15.

Table 22. CONCENTRATIONS OF ORGANIC VAPORS SURROUNDING KIN-BUC DISPOSAL SITE^a

Compound	Sampling Period/Location ^b			
	P2/L1	P2/L2	P2/L3	P2/L4
acetaldehyde	trace	~7,000	~9,000	trace
acrolein	trace	714	trace	trace
benzene	7,718	14,093	10,656	11,343
n-butyl formate	1,902	ND	ND	ND
benzophenone	1,540	ND	ND	ND
3-chloropropene	ND	ND	28,667	ND
carbon tetrachloride	12,687	13,687	7,250	trace
chloroform	1,999	trace	trace	ND
chlorobenzene	ND	ND	trace	trace
cyanobenzene	2,892	ND	3,473	trace
1,2-dichloroethane	trace	434	trace	2,173
ethyl acetate	trace	ND	trace	ND
methylene dibromide	42	ND	ND	ND
methylene chloride	trace	trace	trace	trace
methyl ethyl ketone	ND	ND	trace	trace
3-methylhexanal	1,042	ND	ND	ND
methyl isobutyl ketone	ND	ND	604	ND
1-methylnaphthalene	440	trace	ND	trace

(continued)

Table 22 (cont'd)

Compound	Sampling Period/Location ^b			
	P2/L1	P2/L2	P2/L3	P2/L4
methyl vinyl ketone	ND	ND	trace	ND
tetrachloroethylene	1,187	trace	2,896	trace
dichloroethylene	4,947	4,500	5,263	trace

^a ng/m³

^b Refer to Table 15.

Table 23. CONCENTRATIONS OF ORGANIC VAPORS SURROUNDING KIN-BUC DISPOSAL SITE^a

Compound	Sampling Period/Location ^b			
	P3/L1	P3/L2	P3/L3	P3/L4
acetaldehyde	~18,750	~51,250	~6,500	~6,250
acrolein	trace	1,750	trace	trace
benzene	8,687	6,875	5,906	8,968
benzylchloride	ND	413	ND	ND
n-butyl acetate	ND	ND	371	ND
carbon tetrachloride	3,875	trace	trace	2,000
1-chloro-2-bromoethane	10,071	ND	ND	ND
chlorobenzene	ND	167	480	1,807
2-chloropropane (tent.)	4,067	ND	ND	ND
3-chloropropene	ND	ND	trace	trace
cyanobenzene	ND	ND	trace	323
chloroform	9,000	1,944	12,333	3,445
1,2-dibromoethane	591	ND	ND	trace
1,2-dichloroethane	37,913	ND	trace	347
dichloromethane	7,600	trace	trace	trace
diethyl ether	ND	17,750	ND	3,600
ethyl acetate	ND	ND	ND	trace
methyl isopropyl ketone	ND	ND	trace	ND

(continued)

Table 23 (cont'd)

Compound	Sampling Period/Location ^b			
	P3/L1	P3/L2	P3/L3	P3/L4
methyl vinyl ketone	10,727	trace	trace	2,100
methyl ethyl ketone	14,556	trace	trace	1,278
4-methyl-2-pentanone	trace	trace	trace	ND
2-pentanone	1,742	459	ND	ND
n-pentanal	ND	477	trace	ND
n-propyl acetate	ND	trace	trace	ND
1,1,1-trichloroethane	ND	ND	19,167	trace
1,1,2-trichloroethane	3,500	ND	ND	ND
trichloroethylene	3,737	trace	6,895	10,315
vinyl acetate	ND	trace	trace	ND

^a ng/m³.^b Refer to Table 15.

Table 24. CONCENTRATIONS OF ORGANIC VAPORS SURROUNDING KIN-BUC DISPOSAL SITE^a

Compound	Sampling Period/Location ^b			
	P4/L1	P4/L2	P4/L3	P4/L4
acetaldehyde	~24,000	trace	~25,000	~14,000
benzaldehyde	2,753	trace	trace	ND
benzene	trace	24,718	5,375	10,031
carbon tetrachloride	1,937	1,875	7,625	trace
chlorobenzene	1,127	trace	607	610
chloroform	186	5,834	8,999	2,778
3-chloropropene	ND	ND	2,428	ND
cyanobenzene	4,553	trace	trace	ND
1,2-dibromoethane	ND	ND	535	ND
1,2-dichloroethane	ND	trace	1,130	ND
ethyl acetate	ND	trace	4,133	trace
n-hexanal	ND	trace	trace	800
n-heptanal	ND	ND	ND	713
methylene chloride	trace	trace	trace	trace
methyl ethyl ketone	5,111	trace	trace	trace
methyl vinyl ketone	ND	trace	3,500	trace
methyl isobutyl ketone	ND	trace	5,472	ND

(continued)

Table 24 (cont'd)

Compound	Sampling Period/Location ^b			
	P4/L1	P4/L2	P4/L3	P4/L4
n-nonanal	ND	ND	ND	2,265
tetrachloroethylene	2,722	527	9,173	1,389
1,1,1-trichloroethane	trace	trace	7,684	trace
trichloroethylene	trace	394	5,289	trace
benzyl chloride	ND	4,513	ND	ND

^a ng/m³.^b Refer to Table 15.

Table 25. CONCENTRATIONS OF ORGANIC VAPORS SURROUNDING KIN-BUC DISPOSAL SITE^a

Compound	Sampling Period/Location ^b			
	P5/L1	P5/L2	P5/L3	P5/L4
acetaldehyde	trace	~20,833	trace	~3,125
acrolein	trace	3,125	trace	4,000
benzaldehyde	trace	3,400	trace	2,888
benzene	15,969	7,343	trace	7,000
benzyl chloride	ND	6,560	ND	ND
bromobenzene	ND			
bromotoluene	ND	472	ND	ND
n-butyl butyrate	trace	ND	ND	ND
chloroform	17,222	11,111	19,444	8,334
1,2-dichloroethane	ND	ND	7,575	9,565
dichloromethane	trace	trace	40,000	100,000
ethyl acetate	trace	ND	trace	9,467
n-hexanal	trace	1,200	ND	2,288
isopropyl acetate	ND	ND	ND	6,517
methyl ethyl ketone	trace	trace	8,535	1,389
methyl vinyl ketone	ND	trace	trace	7,091
n-nonanal	trace	3,080	ND	2,223
n-octanal	trace	1,250	ND	789

(continued)

Table 25 (cont'd)

Compound	Sampling Period/Location ^b			
	P5/L1	P5/L2	P5/L3	P5/L4
n-pentanal	trace	ND	ND	15,018
tetrachloroethylene	1,360	trace	25,560	34,632
1,1,2-trichloroethane	ND	ND	ND	4,467
1,1,1-trichloroethane	trace	trace	3,417	~150,000
trichloroethylene	trace	trace	18,940	3,684
1,2-dibromoethane	ND	ND	757	ND

^a ng/m³.^b Refer to Table 15.

Table 26. CONCENTRATIONS OF ORGANIC VAPORS SURROUNDING KIN-BUC DISPOSAL SITE^a

Compound	Sampling Period/Location ^b			
	P6/L1	P6/L2	P6/L3	P6/L4
acetaldehyde	~14,750	~25,000	NQ	~625
acrolein	trace	trace	NQ	ND
benzaldehyde	trace	3,400	2,525	2,888
benzene	10,156	6,875	191,000	27,343
benzyl chloride	ND	8,033	ND	ND
bromotoluene	ND	472	ND	ND
n-butyl butyrate	ND	trace	ND	1,517
carbon tetrachloride	3,125	625	10,600	7,000
chloroform	944	2,500	27,200	28,334
1,2-dichloroethane	trace	ND	27,700	260
dichloromethane	3,000	trace	260,000	~42,000
ethyl acetate	trace	ND	232,000	4,066
n-hexanal	trace	1,200	trace	2,288
isopropyl acetate	ND	ND	NQ	6,517
methyl ethyl ketone	trace	555	33,300	400
methyl vinyl ketone	trace	trace	trace	7,091
n-nonanal	ND	3,080	ND	trace

(continued)

Table 26 (cont'd)

Compound	Sampling Period/Location ^b			
	P6/L1	P6/L2	P6/L3	P6/L4
<u>n</u> -octanal	ND	1,250	ND	ND
<u>n</u> -pentanal	ND	trace	38,000	15,018
tetrachloroethylene	694	1,229	394,000	12,500
1,1,2-trichloroethane	ND	ND	ND	4,467
1,1,1-trichloroethane	trace	417	121,000	75,000
trichloroethylene	trace	trace	trace	10,606
1,1-dichloroethane	ND	ND	22,700	ND
methyl isobutyl ketone	ND	ND	444,500	ND
1,1,2,2-tetrachloroethane	ND	ND	15,000	1,389
bromoxylene	ND	ND	50,500	ND

^ang/m³.^bRefer to Table 15.

Table 27. AMBIENT AIR SAMPLES FROM KIN-BUC DISPOSAL SITE
ANALYZED FOR VINYL CHLORIDE

Sampling Period/Location ²	VC (ppb) ^b
P2/L4	<.016
P3/L3	<.016
P4/L3	<.016
P5/L3	<.036
P6/L3	<.036

^aSee Table 15 for protocol.

^bSince vinyl chloride was not detected, values are expressed in terms of detection limit of method.

In Appendix A, Tables A25-A41 list the volatile organic compounds which were identified in ambient air samples taken from these sites. Table 28 summarizes the volatile halogenated compounds identified in samples from each of these sites. A total of 42 halogenated compounds was detected. Among them were vinyl chloride, bis-(chloromethyl)ether, bromoform, ethylene dibromide (1,2-dibromoethane), phosgene and several chlorinated ethanes, propanes, propenes, butanes and aromatics. We again detected the presence of 3-chloro-1,3-butadiene (chloroprene) in samples taken at Milby Park, Houston, TX. The location HL1 (Fig. 12) represents a downwind position from the industrial complex in this area. Of particular interest in this sample was the identification of t-butanol, isopropanol, crotonaldehyde, and 4-vinylcyclohexene. The presence of 4-vinylcyclohexene was particularly intriguing because of the possibility that the corresponding oxide could be present from photochemical reactions; however, it was not detected in these samples.

In the Pasadena, Deer Park area, several esters were identified. These were butyl formate, methyl methacrylate, isobutyl methacrylate, n-butyl methacrylate, an alkyl butyrate isomer and an alkyl thialate isomer.

Samples which were collected on Dow Chemical property were analyzed and found to contain many halogenated compounds. Among them were 1,2-dichloroethane, 1,1,1-trichloroethane, carbon tetrachloride, 1,2-dichloropropane, dibromomethane, 1,1,2-trichloroethane, 1,1,1,2-tetrachloroethane, bromoform and bis-(2-chloroisopropyl)ether. Several esters were also identified. These were: 2-butyl-n-butyrate, n-butyrate, dimethyl phthalate, diethyl phthalate, 2,6-di-t-butyl-4-phenoxyphenol and dipropyl phthalate. A second sample taken at a different location on Dow property also contained bis-(2-chloroisopropyl)ether. Furthermore, 2 alcohols, 2-t-cyclohexanol and tripropylene glycol were identified. This sample also contained hexachloro-1,3-butadiene. At a third location on Dow property, other compounds of interest were detected. These were chloroethane, vinylidene chloride, phosgene, ethylene glycol dimethyl ether, 1,1,2-trichloroethane, 1,2-dibromoethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, pentachloroethane, perchloroethane, tripropylene glycol, dibutoxyethane and diphenyl ether.

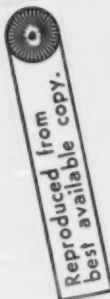


Table 28. SUMMARY OF VOLATILE HALOGENATED COMPOUNDS IN AMBIENT AIR IN HOUSTON, PASADENA, DEER PARK, FREEPORT AND LA PORTE, TX AREAS

Chemical Class	Locations ^a													
	HL1	HL2	HL3	FL1	FL2	FL3	FDL1	DSL2	DDL1	DTL2	DTL3	DTL4	FL1	FL2
HALOGENATED HYDROCARBONS														
dichlorodifluoroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichlorofluoroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
trichlorofluoroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
1,1,1,2-tetrachlorodifluoroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichloroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
2-chloro-1,3-butadiene	+	-	+	-	-	+	-	-	-	-	-	-	-	-
(chloroprene)	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichloropropene isomer (tent.)	+	-	+	-	-	+	-	-	-	-	-	-	-	-
chloroform	+	-	+	-	-	+	-	-	-	-	-	-	-	-
phosgene	+	-	+	-	-	+	-	-	-	-	-	-	-	-
vinylidene chloride	+	-	+	-	-	+	-	-	-	-	-	-	-	-
1,1-dichloroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
1,2-dichloroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
1,1,1-trichloroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
carbon tetrachloride	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichloropropene isomer	+	-	+	-	-	+	-	-	-	-	-	-	-	-
trichloroethylene	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichlorobutene isomer	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichlorobutene isomer	+	-	+	-	-	+	-	-	-	-	-	-	-	-
1,1,2-trichloroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
tetrachloroethylene	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dibromochloroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichlorobutane isomer	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichloropropene isomer(s)	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichlorobenzene isomer	+	-	+	-	-	+	-	-	-	-	-	-	-	-
dichlorobenzene isomer	+	-	+	-	-	+	-	-	-	-	-	-	-	-
1,1,1,2-tetrachloroethane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
tetrachlorohexafluorobutane	+	-	+	-	-	+	-	-	-	-	-	-	-	-
(tent.)	+	-	+	-	-	+	-	-	-	-	-	-	-	-

(continued)

Table 28 (cont'd)

Chemical Class	Locations														
	HL1	HL2	HL3	FL1	FL2	FL3	DSL1	DSL2	DDL1	DTL1	DTL3	DTL4	FL4	FL2	FL3
bromide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis-(2-chloropropyl)ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-hexachlorobutadiene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
chlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-dibromopropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tetrachloropropene isomer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-dibromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-tetrachloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-trichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-trichloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
perchloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
chloropropene isomer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
dichloroethylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trichloropropene isomer(s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3-dichloro-1-propanol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-bis-(5-chloroethoxy)ethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-dichloro-2-methylpropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trichloro-2-methylpropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tetrachlorobutadiene isomer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pentachlorobutadiene isomer(s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vinyl chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis-(chloromethyl)ether (tent.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^a See Fig. 12-16 for sampling locations.

^b More than one isomer was detected.

The ambient air levels of halogenated and other organics in samples from Houston, Pasadena, Deer Park, Freeport and La Porte, TX areas are given in Tables 29 and 30. The concentration of 2-chloro-1,3-butadiene (chloroprene) was found to be 4,000 ng/m³ in the ambient air samples taken in Milby Park, Houston, TX. Many other halogenated compounds were also detected and quantified (Table 29). The concentrations of several oxygenated compounds are also presented in this table. All of the compounds were esters and principally esters of butyric acid, phthalic acid or acrylates. Table 30 presents the minimum total weight of the ambient air levels of volatile organics for the two chemical classes listed in Table 29. It is interesting to note that the higher concentrations generally occur for those samples collected downwind from the industrial complexes.

Organic Vapors in Ambient Air from the Iberville Parish Area, LA

The area near Geismar, LA was selected for study since it contained chemical industry known to be involved in the production of many chemical classes of compounds for which our analytical methodology had not yet been validated. This geographical area provided an opportunity to examine the performance of the collection and analysis methods developed under this contract program. Table 31 presents the chemical production occurring at these industrial sites in Geismar, LA. In general, oxygenated and nitrogen-containing compounds were the predominant materials which were or had been synthesized. Many potential chlorinated hydrocarbons could also be emitted from some of these industries principally on the basis of their production activities. Thus, on the basis of the suspected presence of the oxygen-, nitrogen- and halogenated-containing compounds in the atmospheres in the Geismar area, we proceeded to employ a sampling network for collection and analysis.

Table 17 presented the sampling protocol which principally consisted of two types of sampling strategies. The first was the collection of organic vapors using a sampling period with the integration over a period of 24 hrs and the second utilized short sampling periods of 2-3 hrs. Additional information on the surface weather conditions were obtained from the airport in Baton Rouge, LA. These data are summarized in Table 31. Table 32 presents the ozone concentrations which were monitored in Baton Rouge, LA concurrently during the sampling efforts which were expended in the Geismar

Table 29. AMBIENT AIR LEVELS OF HALOGENATED AND OTHER ORGANICS IN HOUSTON, PASADENA, DEER PARK, FREEPORT AND LA PORTE, TX AREAS

Chemical Class	HL1	HL2	HL3	FL1	FL2	PSL1	PSL2	POLL1	DTL1	DTL2	DTL3	DTL4	FL2	FL3	LL1	LL2	LL3
HALOGENATED HYDROCARBONS																	
2-chloro-2,3-butadiene (chloroprene)	5,000 ^a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
dichloropropene isomer (trans)	11,539	-	11,538	-	-	-	6,420	7,692	1,923	8,846	T	15,384	280	T	8,461	8,450	7,692
chloroform	-	-	-	-	-	555	-	-	-	-	-	-	-	531	-	-	-
vinylidene chloride	-	-	-	-	-	154	-	6,722	T	4,055	T	-	3,300	4,500	778	-	-
1,1-dichloroethane	-	-	-	158	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-trichloroethane	-	-	900	-	-	-	144	-	-	1,070	400	400	16,600	15,200	3,880	27,700	T
carbon tetrachloride	238	334	-	T	146	-	-	-	T	T	276	69	11,538	T	T	1,230	T
dichloropropane isomer	-	-	-	-	-	-	-	2,535	-	2,586	-	-	107	200	-	-	43
trichloroethylene	75	-	39	76	5,073	321	-	-	-	-	-	-	-	-	-	-	T
dichlorobutene isomer	-	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-trichloroethane	262	-	-	-	-	-	-	-	-	3,334	-	-	-	-	17	83	T
tetrachloroethane	29	T	21	20	18	6,709	T	2,019	75	88	-	72	94	1,585	-	-	-
dichlorobutane isomer	52	-	-	-	-	180	-	-	T, T	241	-	T	-	-	-	-	-
dichloropropene isomer(s)	-	-	-	-	-	90	-	-	-	1,293	-	-	-	-	-	-	-
1,1,1,2-tetrachloroethane																	
bis-(2-chloroisopropyl)-ether	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-
hexachloro-1,3-butadiene	-	-	-	-	-	-	-	334	-	2,066	-	25	27	333	-	-	T
1,2-dibromopropane	-	-	-	-	-	-	-	-	-	-	-	-	13.3	8.3	-	T	T
1,1,2,2-tetrachloroethane	-	-	-	-	-	-	-	-	-	19	-	-	-	33	-	-	-
1,1,2-trichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	298	-	-	-
pentachloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	3,984	-	-	-
perchloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	2,903	-	-	-

(continued)

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Table 29 (cont'd)

Chemical Class	HL1	HL2	HL3	FL1	FL2	DBL1	DBL2	DTL1	DTL2	DTL3	DTL4	FL2	FL3	LL1	LL2	LL3
tetrahydrobutadiene isomer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pentachlorobutadiene isomer(s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vinyl chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trichloropropene isomer(s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OXYGENATED COMPOUNDS																
isobutyl isobutyrate	-	1,233	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-butyl-2-butyrate	-	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-butyl-2-butyrate	-	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-
diethyl phthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
diethyl phthalate	-	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-
amyl benzoate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
dibutyl phthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
isobutyl methacrylate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-butyl methacrylate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sec-butyl acrylate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-butyl acrylate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-hexyl acrylate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^aValues are in ng/m³.

Table 30. ESTIMATED MINIMUM TOTAL AMBIENT AIR LEVELS OF VOLATILE ORGANIC
CHEMICAL CLASSES

Chemical Class	HL1	HL2	HL3	PL1	PL2	DSL1	DSL2	DDL1	DTL1	DTL2	DTL3	DTL4	FL2	FL3	LL1	LL2	LL3
Halogenated hydrocarbons	16,737 ^a	1,100	12,518	294	5,433	128,948	6,604	19,409	2,078	25,398	716	15,990	32,028	40,026	13,165	37,926	7,832
Oxygenated Compounds	370	1,966	-	20	-	134	60	6,947	3,734	120	60	1,020	2,726	2,596	4,601	9,634	6,253

Table 31. SURFACE WEATHER OBSERVATIONS FOR BATON ROUGE, LA

Date	Time	Sky & Ceiling	Temperature (°F)	Wind	
				Direction (00-36)	Speed (Kts.)
2/28/77	0053	CLR	41	00	00
	0152	CLR	37	00	00
	0252	CLR	37	00	00
	0355	CLR	36	05	03
	0453	CLR	36	00	00
	0555	CLR	35	00	00
	0652	CLR	36	00	00
	0717	CLR	40	00	00
	0852	CLR	46	12	06
	0953	CLR	51	12	04
	1052	CLR	53	05	05
	1152	CLR	58	08	07
	1252	CLR	59	33	05
	1352	CLR	61	30	05
	1452	CLR	62	26	08
	1651	CLR	62	29	09
	1751	CLR	61	29	08
	1857	CLR	59	27	05
	1951	CLR	53	00	00
	2051	CLR	51	24	03
	2152	CLR	51	24	03
	2251	CLR	50	23	06
	2351	CLR	49	24	03
3/1/77	0051	CLR	45	00	00
	0152	CLR	41	00	00
	0252	CLR	40	00	00

(continued)

Table 31 (cont'd)

Date	Time	Sky & Ceiling	Temperature (°F)	Wind	
				Direction (00-36)	Speed (Kts.)
	0353	CLR	39	00	00
	0451	CLR	39	00	00
	0551	CLR	39	00	00
	0651	CLR	38	00	00
	0752	CLR	43	00	00
	0852	CLR	54	23	07
	0952	CLR	59	21	09
	1052	CLR	62	23	06
	1152	CLR	64	27	07
	1252	CLR	66	27	06
	1352	300-SCT	68	21	05
	1454	E300 BKN	67	11	06
	1552	E300 BKN	66	17	07
	1651	E300 BKN	66	16	05
	1751	E300 BKN	62	22	09
	1853	E300 BKN	58	22	08
	1953	E300 BKN	57	18	07
	2057	E300 BKN	55	17	05
	2151	300 SCT	52	18	08
	2251	300 SCT	52	18	06
	2351	300 SCT	50	14	04
3/2/77	0053	300 SCT	48	14	04
	0152	300 SCT	46	11	07
	0253	300 BKN	44	14	05
	0354	300 BKN	45	14	08
	0454	300 BKN	45	08	07
	0552	100 SCT 300 SCT	44	08	08

(continued)

Table 31 (cont'd)

Date	Time	Sky & Ceiling	Temperature (°F)	Wind	
				Direction (00-36)	Speed (Kts.)
	0652	E50 BKN 300 BKN	47	08	08
	0752	E45 OVC	50	11	08
	0852	E45 OVC	45	13	09
	0952	E45 BKN 100 BKN 300 BKN		13	15
	1052	E45 BKN 100 OVC	46	15	15
	1152	E45 BKN 100 OVC	42	14	12
	1252	E45 BKN 100 OVC	44	14	16
	1352	45 SCT E 100 OVC	45	13	20
	1453	40 SCT E 80 OVC	45	13	18
	1553	E 75 OVC	45	13	14
	1655	40 SCT E60 OVC	46	14	15
	1752	40 SCT E70 OVC	49	12	11
	1853	E50 OVC	51	12	11
	1951	M32 BKN 70 OVC	52	11	12
	2056	M32 OVC	53	12	13
	2151	M32 OVC	53	12	12
	2209	M25 OVC	-	12	10
	2253	M28 OVC	54	12	09
	2351	M23 OVC	54	12	08
3/3/77	0053	17 SCT E60 OVC	60	10	08
	0130	M14 BKN 60 OVC		09	06
	0152	M14 BKN 60 OVC	60	09	06
	0254	M17 BKN 60 OVC	60	12	08
	0352	M11 OVC	60	12	07
	0405	M9 OVC	-	10	06
	0453	M7 OVC	62	13	13
	0555	M7 OVC	64	13	11

(continued)

Table 31 (cont'd)

Date	Time	Sky & Ceiling	Temperature (°F)	Wind	
				Direction (00-36)	Speed (Kts.)
0652		M10 OVC	65	14	12
0751		M10 OVC	68	12	16
0851		M17 OVC	68	16	20
0943		M17 OVC	-	15	18
0955		M17 OVC	68	15	17
1058		M17 OVC	67	15	14
1144		M17 OVC	-	16	14
1152		M17 OVC BKN 100 OVC	69	18	16
1255		M17 OVC	70	17	12
1352		M19 OVC	71	18	15
1455		11 SCT M20 OVC	72	17	23
1554		11 SCT M25 BKN 70 OVC	72	19	18
1657		11 SCT M19 BKN 70 OVC	72	18	18
1756		M19 OVC	72	18	19
1856		M19 OVC	72	19	20
1951		M19 OVC	73	20	17
2051		M23 OVC	73	18	15
2152		M19 OVC	71	21	15
2206		M11 OVC	-	21	15
2253		M11 OVC	71	21	16
2319		M7 OVC	-	27	14
2330		M5 OVC	-	01	15
2355		M7 OVC	56	35	16

Table 32. OZONE CONCENTRATIONS IN BATON ROUGE, LA

Hour	Date			
	2/28	3/1	3/2	3/3
1	0.004 ^a	0.007	0.022	0.069
2	0.013	0.009	0.016	0.063
3	0.015	0.019	0.009	0.061
4	0.005	0.021	0.008	0.057
5	0.008	0.008	0.033	0.050
6	0.001	0.006	0.042	0.043
7	0.000	0.005	0.020	0.032
8	0.001	0.009	0.007	0.030
9	0.003	0.094	0.018	0.034
10	0.022	0.071	0.041	0.035
11	- ^b	0.087	0.063	0.030
12	-	0.011	0.067	0.033
13	0.136	0.117	-	0.029
14	0.115	0.115	-	0.034
15	0.095	0.125	-	0.038
16	0.083	0.115	-	0.038
17	0.087	0.110	0.062	0.031
18	0.071	0.097	0.073	0.030
19	0.019	0.063	0.064	0.032
20	0.006	0.045	0.062	0.033
21	0.005	0.050	0.059	0.037
22	0.015	0.025	0.065	0.035
23	0.010	0.014	0.067	0.033
24	0.006	0.008	0.068	0.031

^aValues in ppm.^bPeriod during instrument calibration.

area. As expected, the highest concentrations of ozone were observed through the mid-day period with levels reaching an excess of 100 ppb between the periods of 1200-1700 hrs. On the fourth day of sampling (March 3, 1977), the levels of ozone were rather constant between 30-60 ppb. Considerable overcast during these sampling periods was observed.

In Appendix A, Tables A42-A46 list the volatile organic vapors which were identified in ambient air from Geismar, LA. Table 33 summarizes the halogenated, oxygenated, nitrogenous and sulfur-containing compounds detected in these samples. A total of 16 halogenated hydrocarbons was identified. Among these were carbon tetrachloride, methyl chloroform, methylene chloride and vinylidene chloride. These chemicals were reported to be produced by industry in this area (Table 13).

Four nitrogenous compounds were identified in samples taken downwind from Rubicon Chemicals, Inc. These were nitrobenzene, 2-dinitrobenzene isomers and diphenylamine. These compounds were also chemicals which were reported to be produced by Rubicon.

Three sulfur compounds and approximately 26 oxygenated compounds were characterized in ambient air samples. Several ethers and alcohols were present. However, we did not detect any glycol ethers which were reported to be produced by Shell Oil Co. in this area. From previous research, we of course have shown that the collection, thermal desorption and analysis of ethylene glycol and its analogs can not be achieved using the standard methods which we have been employing.

Table 34 presents the estimated levels of ambient air pollutants in samples from the Iberville Parish area. The relatively higher concentrations of the halogenated compounds appeared to be associated with the downwind positions of the industrial activity. Only trace quantities of the nitrogenous compounds and sulfur-containing organics were present.

SUMMARY

The three principal geographical areas (New Jersey, Texas, and Louisiana) afforded many different types of chemical industry producing a large array of chemical classes of compounds for the determination of the performance of the collection and analysis method developed under this contract program. As evident by the results previously discussed, the technique is capable of collecting and analyzing compounds containing a wide variety of

Table 33. SUMMARY OF VOLATILE ORGANIC VAPORS IDENTIFIED IN AMBIENT AIR FROM GEISMAR, LA

Chemical Class	Compound	Sampling Locations					L-R ^a
		L-12	L-14	L-15	L-16		
Halogenated hydrocarbon	dichloromethane	+	+	+	+		+
	chloroethane	-	+	-	-		-
	dichloroethylene isomer	-	+	-	-		-
	chloroform	+	+	+	+		+
	dichloroethylene isomer	-	+	-	-		-
	1,1-dichloroethane	-	+	-	-		-
	1,1,1-trichloroethane	+	+	-	+		-
	1,2-dichloroethane	+	+	+	+		+
	carbon tetrachloride	+	+	+	+		+
	trichloroethylene	+	-	+	-		-
	1,2-dichloropropane	-	-	-	+		+
	tetrachloroethylene	+	+	+	+		-
	1,1,2-trichloroethane	-	+	+	-		-
	chlorobenzene	-	+	+	+		+
	dichlorobenzene isomer	-	+	+	-		+
	dichlorobenzene isomer	-	+	+	-		+
Oxygenated Compounds	benzaldehyde	+	+	+	+		+
	phenol	+	+	-	+		+
	acetophenone	+	+	+	+		+
	n-nonanal	+	-	+	-		-
	cresol isomer	+	+	+	+		+
	n-decanal	+	-	+	-		-
	isobutyl isobutanoate	+	+	+	-		-
	butyl butanoate	+	+	+	-		-
	furan	-	+	+	+		-

(continued)

Table 33 (cont'd)

Chemical Class	Compound	Sampling Locations				
		L-12	L-14	L-15	L-16	L-R ^a
	acetone	-	+	+	+	+
	biphenyl ether	-	+	+	-	-
	isopropanol	-	-	+	-	-
	t-butanol	-	-	+	-	-
	2-methyl-3-pentanol (tent.)	-	-	+	-	-
	dimethyl-3-pentanol isomer	-	-	+	-	-
	vinyl acetate	-	-	+	+	-
	propionic acid (tent.)	-	-	-	+	-
	acetaldehyde	-	+	+	-	+
	propanal	+	+	-	+	+
	propenal	+	+	-	+	+
	dimethyl ether	+	-	+	+	+
	diethyl ether	+	-	+	-	-
	n-butanol	+	-	-	-	-
	methyl ethyl ketone	+	-	-	-	-
	n-pentanal	+	-	-	-	-
	n-hexanal	+	-	-	-	-
Nitrogenous compounds	nitrobenzene	-	-	-	-	+
	dinitrobenzene isomer	-	-	-	-	+
	2,4-dinitrobenzene	-	-	-	-	+
	diphenylamine (tent.)	-	-	-	-	+
Sulfur compounds	carbon disulfide	-	-	+	-	-
	2,5-diisobutylthiophene	-	-	+	-	-
	benzothiazole	-	-	-	-	+

^aDownwind of Rubicon Chemicals, Inc., see Figure 17 for sampling locations.

Table 34. ESTIMATED LEVELS OF AMBIENT AIR POLLUTANTS IN GEISMAR, LA AREA^a

Compound	L-12	L-13	L-14A	L-15	L-R1	L-14B	L-16	L-R2	L-S	L-B
nitrobenzene	ND ^b	ND	ND	ND	T	ND	ND	107	ND	ND
2,4-dinitrobenzene	ND	ND	ND	ND	T	ND	ND	27	ND	ND
dinitrobenzene isomer	ND	ND	ND	ND	T	ND	ND	T	ND	ND
diphenylamine	ND	ND	ND	ND	T	ND	ND	T	ND	ND
1,2-dichloroethane	683	ND	10333	7844	232	4689	1555	100	800	1444
carbon tetrachloride	400	1133	1433	300	183	4667	10100	300	286	2633
tetrachloroethylene	46	86	43	86	11	100	36	7	32	100
chloroform	1571	3057	3000	11742	857	9943	999	943	10355	1257
1,1,2-trichloroethane	120	150	5450	9611	ND	6900	ND	ND	320	ND
methylene chloride	1700	1909	727	1714	700	545	772	442	2333	454
1,1,1-trichloroethane	T	250	200	200	75	175	400	ND	80	675
1,2-dichloropropane	ND	1163	ND	121	ND	71	39	3999	ND	36
1,1-dichloroethane	ND	ND	235	75	ND	550	133	ND	ND	167
chlorobenzene	ND	ND	93	93	T	143	171	900	ND	ND
vinylidene chloride	ND	ND	T	ND	ND	200	ND	ND	ND	ND
benzene	287	3712	1562	1363	975	575	261	1212	520	712
benzothiazole	ND	ND	ND	ND	T	ND	ND	T	ND	ND
2,5-diisobutylthiophene	ND	ND	ND	T	ND	ND	ND	ND	ND	ND

^a See Table 17 and Fig. 17 for sampling protocol and locations, respectively. Values are in ng/m³.

^b ND = not detected.

heteroatoms in various oxidation states. The chemical classes varied from non-polar to polar compounds with a large array of different types of chemical functionalities. Frequently, the analytical data obtained on samples collected from these geographical areas and the chemical data for which the industry was producing, using or storing compared favorably which assisted in the evaluation and validation of the collection and analysis system. Often the chemicals which were reported as potential emissions from chemical industry were indeed detected and identified by the Tenax GC/SKC carbon sampling device coupled with thermal desorption and high resolution glass capillary column gas chromatography/mass spectrometry/computer analysis.

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APPENDIX A

VOLATILE ORGANIC VAPORS IDENTIFIED AND QUANTIFIED IN AMBIENT AIR

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Part II - Houston, Pasadena, Deer Park, La Porte, and Freeport, TX Sites.	176
Part III - Geismar, LA Site.	215

Table A1. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR
UPWIND FROM KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	53	1-butene		45	126	toluene	
1A	53	n-butane		46	129	C ₈ H ₁₈ (3-methylheptane)	
1B	55	acetaldehyde	trace	47	131	dimethylcyclohexane isomer	
2	62	isopentane		48	133	C ₈ H ₁₄ isomer	
4	64	furan		49	134	C ₈ H ₁₆ isomer	
5	65	C ₅ H ₁₀ isomer		50	135	n-octane	
6	66	n-pentane		51	136	C ₈ H ₁₄ isomer	
7	67	propanal		52	137	C ₈ H ₁₆ isomer	
8	68	C ₅ H ₁₀ isomer		53	138	tetrachloroethylene	354
9	69	dichloromethane		55	144	C ₉ H ₂₀ isomer	
10	73	acetone		56	145	C ₈ H ₁₆ isomer	
11	75	dimethyl ether	trace	57	146	C ₉ H ₂₀ isomer	
12	79	C ₆ H ₁₄ isomer		58	147	C ₉ H ₁₈ isomer	
13	82	C ₆ H ₁₂ isomer		59	149	ethylbenzene	
14	83	3-methylpentane		60	150	C ₉ H ₂₀ isomer	
15	84	C ₆ H ₁₂ isomer		61	151	p-xylene	
16	85	hexafluorobenzene (aE)		62	152	C ₉ H ₂₀ isomer	
17	86	2-methylfuran		63	154	C ₁₀ H ₂₂ isomer	
18	87	n-hexane		64	155	trimethylhexane isomer	
19	88	chloroform	6,389	65	156	p-xylene	
20	90	C ₆ H ₁₂ isomer		66	157	C ₉ H ₁₈ isomer	
21	91	methyl ethyl ketone		67	158	n-nonane	
22	92	perfluorotoluene (aE)		68	159	3,3,5-trimethylheptane	
23	94	2,2-dimethylpentane		69	162	methylnonane isomer	
24	95	2,4-dimethylpentane		70	163	isopropylbenzene + 4- methylnonane	
25	96	2,2,3-trimethylbutane		71	166	2,2,5,5-tetramethylhexane	
26	97	1,1,1-trichloroethane		72	167	C ₁₀ H ₂₀ isomer	
27	98	C ₇ H ₁₄ isomer		73	168	n-propylbenzene	
28	100	benzene	20,343	74	170	benzaldehyde and 2,3-dimethyloctane	80
29	102	3,3-dimethylpentane		75	171	n-ethyltoluene	
30	103	cyclohexane		76	172	2,2,4-trimethylheptane	
31	104	2-methylhexane		77	174	C ₁₀ H ₂₀ isomer	
32	105	2,3-dimethylpentane		78	175	C ₁₀ H ₂₂ isomer	
33	106	3-methylhexane		79	177	ter-butylcyclohexane (tent.)	
34	108	C ₇ H ₁₄ isomer (tent.)		80	178	phenol	
35	109	dimethylcyclopentane (tent.)		80A	17E	1,2,4-trimethylbenzene	
35A	109	trichloroethylene	trace	81	179	n-decane	
36	110	C ₇ H ₁₄ isomer		82	180	methyldecane isomer	
37	111	n-heptane		83	181	m-dichlorobenzene	
38	113	C ₇ H ₁₄ isomer		84	184	C ₁₁ H ₂₄ + C ₄ -alkyl benzene isomers	
39	115	C ₈ H ₁₈ isomer		85	185	1,2,3-trimethylbenzene + C ₁₁ H ₂₄ isomer	
40	117	2,2,4-trimethylpentane		86	189	C ₁₁ H ₂₄ isomer	
41	118	methylcyclohexane					
42	119	C ₈ H ₁₆ isomer					
43	120	C ₈ H ₁₈ isomer					
44	122	C ₈ H ₁₈ isomer					

(continued)

Table A1 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
87	190	sec-butylbenzene					
87A	190	C ₄ -alkyl benzene + C ₁₁ H ₂₄ isomer					
88	191	acetophenone					
89	193	C ₁₂ H ₂₆ isomer					
90	194	C ₅ -alkyl benzene + C ₁₁ H ₂₂ isomer					
91	196	C ₄ -alkyl benzene isomer					
92	198	n-undecane					
93	204	C ₅ -alkyl benzene isomer					
95	209	C ₁₂ H ₂₄ isomer					
97	214	C ₁₂ H ₂₄ isomer					
98	215	n-dodecane					
99	216	naphthalene					
100	225	C ₁₃ H ₂₆ isomer					
101	230	2-undecanone (tent.)					
102	232	C ₁₃ H ₂₆ isomer					
103	233	n-tridecane					
104	236	3-methylnaphthalene					
105	240	C ₁₄ H ₃₀ isomer					
105A	240	C ₁₄ H ₂₈ isomer					
105B	240	n-tetradecane					
105C	240	C ₁₅ H ₃₂ isomer					

^aSampling was conducted on 6/29/76 from 1207 to 1359, see Table 15 for protocol (P1/L1).

Table A2. VOLATILE ORGANICS IN AMBIENT AIR DOWNWIND OF
STAUFFER CHEMICAL CO., EDISON, NJ^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	N ₂ , O ₂		46	120	C ₈ H ₁₈ isomer	
2	43	CO ₂		47	123	C ₇ H ₁₂ isomer	
3	48	n-butane		48	128	toluene	
4	49	unknown		49	130	C ₈ H ₁₈ isomer	
5	49	unknown		50	132	C ₈ H ₁₄ isomer	
6	50	isobutane		51	132	C ₈ H ₁₆ isomer	
7	53	C ₅ H ₈ isomer		52	132	C ₈ H ₁₈ isomer	
8	54	acetaldehyde	-10,250	53	133	C ₈ H ₁₆ isomer	
9	62	methylbutene isomer		54	136	C ₈ H ₁₈ isomer	
10	63	furan		55	138	tetrachloroethylene	1,527
11	63	pentene isomer		57	142	C ₈ H ₁₆ isomer	
12	68	tetramethylethylene oxide (tent.)		58	145	C ₇ H ₁₆ isomer	
13	69	C ₆ H ₁₄ isomer		59	147	C ₈ H ₁₆ isomer	
14	71	C ₇ H ₁₄ isomer		60	150	ethylbenzene	
15	73	acetone		61	152	p- or m-xylene	
16	79	C ₅ H ₁₂ isomer		62	153	C ₈ H ₁₈ isomer	
17	82	methyl-2-methylallyl ether (tent.)		63	155	C ₉ H ₁₆ isomer	
18	84	C ₆ H ₁₄ isomer		64	156	styrene	
19	86	perfluorobenzene (eF)		65	157	o-xylene	
20	88	C ₆ H ₁₄ isomer		66	159	C ₉ H ₂₀ isomer	
22	90	methylallyl alcohol	880	67	162	C ₁₀ H ₂₀ isomer	
23	91	C ₅ H ₁₀ isomer		68	164	C ₃ -alkyl benzene	
24	91	C ₅ H ₁₂ isomer		69	164	C ₉ H ₁₄ isomer	
25	93	C ₅ H ₁₂ isomer		70	166	C ₈ H ₁₈ isomer	
26	94	perfluorotoluene (eF)		71	170	chlorotoluene	2,593
27	95	C ₈ H ₁₄ isomer		72	171	benzaldehyde	
28	97	1,1,1-trichloroethane	trace	73	171	C ₃ -alkyl benzene	
29	101	benzene	93,750	74	172	C ₃ -alkyl benzene	
30	102	C ₆ H ₁₄ isomer		75	174	C ₈ H ₁₆ isomer	
31	102	thiophene		76	175	benzyl acetate	
32	104	C ₆ H ₁₂ isomer		77	176	benzamide (tent.)	
33	104	C ₇ H ₁₆ isomer		78	178	benzyl methyl ether	1,000
34	105	C ₈ H ₁₈ isomer		79	178	C ₁₀ H ₁₈ isomer	
35	106	C ₇ H ₁₄ isomer		80	178	C ₈ H ₁₄ isomer	
36	106	C ₈ H ₁₈ isomer		81	179	phenol	
37	108	C ₆ H ₁₂ isomer		82	179	C ₃ -alkyl benzene	
38	110	trichloroethylene	210	83	180	C ₁₀ H ₂₂ isomer	
39	111	allyl acetate	30,697	84	181	1-methyl-2-chlorobenzene	1,873
40	112	C ₇ H ₁₆ isomer		85	182	dichlorobenzene	
41	113	C ₇ H ₁₀ isomer		86	184	C ₁₀ H ₂₀ isomer	
42	114	C ₇ H ₁₆ isomer		87	185	C ₄ -alkyl benzene	
43	116	tetramethylpentane		88	187	methylbromobenzene	507
44	117	C ₇ H ₁₄ isomer		89	189	C ₁₀ H ₂₀ isomer	
45	118	C ₈ H ₁₈ isomer		90	190	C ₄ -alkyl benzene	
				91	191	C ₃ -alkyl benzene	
				92	193	C ₉ H ₁₆ isomer	

(continued)

Table A2 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
93	195	C ₄ -alkyl benzene					
94	198	methylbenzoate (tent.)					
95	199	C ₁₁ H ₂₄ isomer					
96	202	C ₁₂ H ₂₄ isomer					
97	204	C ₄ -alkyl benzene					
98	204	indole (?)					
99	206	C ₁₁ H ₂₂ isomer					
100	208	C ₁₁ H ₂₂ isomer					
102	212	C ₄ -alkyl benzene					
103	214	C ₄ -alkyl benzene					
104	215	C ₅ -alkyl benzene					
105	216	C ₁₂ H ₂₆ isomer					
106	217	naphthalene					
107	219	benzophenone					
108	222	ethyl phenyl acetate	trace				
109	229	C ₁₀ H ₂₀ isomer					
110	231	dimethylchlorobenzene (tent.)					
111	232	propylthiophene (tent.)					
112	234	C ₁₃ H ₂₈ isomer					
113	237	dicyanobenzene (tent.)					
114	238	C ₁₁ H ₂₀ isomer					
115	240	C ₁₂ H ₂₄ isomer					
116		C ₁₃ H ₂₆ isomer					
117		C ₁₃ H ₂₈ isomer					
118		dimethylindane					
119		C ₁₁ H ₂₂ isomer					
120		C ₄ -alkyl tetrahydronaphthalene					
121		C ₁₄ H ₃₀ isomer					
122		C ₁₁ H ₂₂ isomer					
123		C ₁₁ H ₂₂ isomer					
124		C ₁₅ H ₃₂ isomer					

^a Sampling was conducted on 6/29/76 from 1206 to 1355, see Table 15 for protocol (P1/L2).

Table A3. ORGANIC VOLATILES IN AMBIENT AIR DOWNWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	41	N ₂ + O ₂		27	122	4-methyl-2-pentanone	2,125
2	42	CO ₂		28	125	2-methyl-2-pentanone	45
4	49	chloromethane		29	128	toluene	
4A	50	propane (tent.)		30	130	2,4-dimethylhexane	
5	51	1-butene		31	132	dimethylcyclohexane isomer	
5A	52	n-butane		32	134	C ₈ H ₁₆ isomer	
6	55	acetaldehyde	trace	33	136	n-octane	
7	61	isopentane		34	138	n-butyl acetate	129
7A	63	C ₅ H ₁₀ isomer		35	139	tetrachloroethylene	
8	64	furan		37	141	C ₈ H ₁₆ isomer	
8A	64	C ₅ H ₁₀ isomer		37A	143	2-hexanone	trace
9	67	n-pentane		37B	144	C ₉ H ₂₀ isomer	
10	69	propanal		38	145	C ₉ H ₂₀ isomer	
10A	70	acrolein	trace	38A	146	C ₈ H ₁₆ isomer	
11	72	acetonitrile (tent.)		39	147	chlorobenzene	
12	76-81	acetone		40	150	ethylbenzene	
12A	80	dimethyl ether	trace	40A	151	2-methyloctane	
12B	81	2-methylpentane		41	152	p-xylene	
13	82	2-methylpropanal (tent.) + C ₆ H ₁₂ isomer		42	153	3-methyloctane	
14	86	hexafluorobenzene (eW)		42A	154	3-heptanone	trace
14A	87	n-hexane		42B	155	2-heptanone	trace
14B	88	butanal		42C	156	styrene	
14C	89	chloroform	trace	43	157	1,1,3,3-tetramethyl- cyclopentane	
14D	90	isopropyl ether	trace	44	157	o-xylene	
14E	92	C ₇ H ₁₆ isomer		44A	158	C ₉ H ₁₈ isomer	
15	93	perfluorotoluene (eW)		45	159	n-nonane	
16	95	methyl ethyl ketone	1,500	45A	160	C ₉ H ₁₈ isomer	
17	97	1,1,1-trichloroethane		45B	162	C ₉ H ₁₈ isomer	
18	101	benzene	9,687	46	164	2,2,4-trimethylheptane	
18A	103	carbon tetrachloride	1,312	47	165	isopropylbenzene	
19	104	2-methylhexane + cyclohexane		47A	165	C ₁₀ H ₂₂ isomer	
20	105	2,3-dimethylpentane		47B	166	C ₁₀ H ₂₂ isomer	
21	106	3-methylhexane		48	167	2,6-dimethyloctane	
22	109	C ₇ H ₁₆ isomer		48A	167	isopropylcyclohexane	
22A	110	dimethylcyclopentane		49	168	C ₁₀ H ₂₀ isomer	
23	111	trichloroethylene	1,315	49A	168	4-methylnonane	
23A	111	C ₇ H ₁₄ isomer		50	169	C ₁₀ H ₂₀ isomer	
24	112	n-heptane		51	171	n-propylbenzene	
24A	113	n-pentanal		51A	171	benzaldehyde	
25	115	2-pentanone		52	172	m-ethyltoluene	
25A	116	acetic acid	-91	52A	173	C ₁₀ H ₂₂ isomer	
25B	117	C ₈ H ₁₈ isomer		53	174	C ₁₁ H ₂₄ isomer	
26	119	methylcyclohexane		54	175	phenol	
26A	120	2-methylheptane		54A	175	cyanobenzene	trace
26B	121	3-methylheptane		55	176	o-ethyltoluene	

(continued)

Table A3 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
56	177	C ₁₀ H ₂₂ isomer		84	236	C ₁₄ H ₂₈ isomer	
57	178	C ₁₀ H ₂₀ isomer		85	239	C ₁₄ H ₃₀ isomer	
58	179	1,2,4-trimethylbenzene		87	240	dodecanone isomer	
59	180	n-decane		87A	240	n-butyl butyrate	43
59A	182	C ₁₀ H ₂₀ isomer		88	240	n-tetradecane	
60	183	m-dichlorobenzene or (p)					
60A	184	C ₁₁ H ₂₄ isomer					
61	185	C ₁₁ H ₂₄ + C ₄ -alkyl benzene isomers					
61A	186	C ₁₁ H ₂₄ isomer					
61B	187	C ₁₁ H ₂₄ isomer					
62	188	butylcyclohexane					
62A	189	C ₁₁ H ₂₂ isomer					
62B	189	C ₁₂ H ₂₆ isomer					
63	190	p-propyltoluene					
64	191	diethylbenzene isomer + C ₁₁ H ₂₄ isomer					
65	192	acetophenone					
66	194	C ₁₂ H ₂₆ isomer					
67	196	o-propyltoluene					
67A	197	C ₄ -alkyl benzene isomer					
67B	197	C ₁₀ H ₁₈ isomer (tent.)					
68	198	C ₁₀ H ₁₆ isomer + C ₁₂ H ₂₆ isomer					
68A	199	C ₁₁ H ₂₂ isomer					
69	200	n-undecane					
69A	201	C ₁₂ H ₂₄ isomer					
70	202	C ₁₂ H ₂₆ isomer					
70A	204	C ₁₂ H ₂₆ isomer					
71	205	tetramethylbenzene isomer					
72	209	C ₁₂ H ₂₄ isomer					
72A	210	C ₁₂ H ₂₆ isomer					
73	211	C ₄ -alkyl benzene isomer					
73A	212	tetramethylbenzene isomer					
73B	213	C ₁₃ H ₂₈ isomer					
74	214	5-decanone					
74A	215	C ₁₂ H ₂₄ isomer					
75	216	C ₁₃ H ₂₈ isomer					
76	217	n-dodecane					
76A	218	naphthalene					
77	220	C ₁₃ H ₂₈ isomer					
77A	230	phenylhexane					
80	231	undecanone isomer					
81	233	C ₁₃ H ₂₈ isomer					
82	234	C ₁₃ H ₂₆ isomer					
83	235	n-tridecane					

^a Sampling was conducted on 6/29/76 from 1207 to 1359, see Table 15 for protocol (P1/L3).

Table A4. VOLATILE ORGANICS IN AMBIENT AIR DOWNWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphi- Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphi- Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	41	N ₂ + O ₂		29	108	3-ethylpentane and dimethyl- cyclopentane isomer	
2	43	CO ₂		30	109	trichloroethylene	10,052
3	44	propene (tent.)		30A	110	n-pentanal	
4	47	chloromethane		31	111	n-heptane	
5	49	propane		31A	113	2-pentanone	
5A	52	1-butene		31B	115	acetic acid (tent.)	trace
6	53	n-butane		32	117	n-propyl acetate	
6A	54	2-butene		32A	117	C ₈ H ₁₈ isomer	
7	55	acetaldehyde	~3,125	33	118	methylcyclohexane	
9	61	isopentane		33A	119	C ₈ H ₁₆ isomer	
9A	63	C ₅ H ₁₀ isomer		33B	119	C ₈ H ₁₈ isomer	
9B	64	furan		34	120	4-methyl-2-pentanone	5,958
10	65	n-pentane		35	122	3-methyl-2-pentanone	1,140
11	67	propanal		36	125	C ₈ H ₁₆ isomer	
12	69	acrolein	4,000	37	127	toluene	
12A	70	dichloromethane			128	2-methylheptane	
13	72	C ₆ H ₁₂ isomer			129	3-methylheptane	
14	76	acetone		38A	131	C ₇ H ₁₂ isomer	
15	78	dimethyl ether	10,500	39	132	dimethylcyclohexane isomer	
16	80	2-methylpentane		40	133	n-hexanal	
16A	81	diethyl ether (tent.)		40A	134	C ₈ H ₁₆ isomer	
17	82	2-methylpropanal		41	135	n-octane	
17A	83	3-methylpentane		42	137	n-butyl acetate	4,774
17B	84	vinyl acetate	583	43	138	tetrachloroethylene	
18	85	hexafluorobenzene (eW)		45	141	C ₈ H ₁₈ isomer + unknown	
18A	85	2-methylpropanal		46	143	C ₉ H ₂₀ isomer	
19	86	n-hexane		47	144	C ₉ H ₂₀ isomer	
19A	87	n-butanal		47A	145	ethylcyclohexane	
20	88	chloroform + isopropyl ether	trace	48	146	chlorobenzene	507
20A	90	C ₅ H ₁₀ isomer		48A	147	C ₉ H ₁₈ isomer	
20B	91	methyl ethyl ketone	trace	49	149	ethylbenzene	
21	92	perfluorotoluene (eW) and ethyl acetate		49A	149	C ₉ H ₁₈ isomer	
22	93	C ₆ H ₁₂ isomer		49B	150	C ₉ H ₂₀ isomer	
22A	95	1,2-dichloroethane	217	50	151	p-xylene	
23	96	1,1,1-trichloroethane		50A	152	C ₉ H ₂₀ isomer	
24	99	methyl isopropyl ketone		51	152	C ₉ H ₂₀ isomer	
24A	100	C ₇ H ₁₄ isomer		51A	153	3-heptanone	trace
25	101	benzene	13,406	51B	154	2-heptanone	trace
25A	102	carbon tetrachloride	750	51C	155	styrene	
26A	103	cyclohexane		52	156	heptanal	
26	103	2-methylhexane		53	157	p-xylene	
27	104	2,3-dimethylpentane		53A	157	C ₉ H ₁₈ isomer	
28	105	3-methylhexane		54	158	n-nonane	
28A	107	C ₇ H ₁₄ isomer		55	163	C ₁₀ H ₂₂ isomer	

(continued)

Table A4 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/a ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/a ³
56	164	isopropylbenzene		87	216	C ₁₃ H ₂₈ isomer	
56A	164	4-methylnonane		88	217	n-dodecane and naphthalene	
56B	165	C ₃ -alkyl cyclohexane isomer		89	220	C ₁₂ H ₂₄ isomer	
57	166	2,6-dimethyloctane		93	232	undecanone isomer	
58	167	isopropylcyclohexane		94	233	C ₁₃ H ₂₈ isomer	
59	169	α-pinene + C ₁₀ H ₂₂ isomer		95	234	n-tridecane	
59A	169	n-propylbenzene		96	239	8-methylnaphthalene	
60	170	benzaldehyde		97	240	α-methylnaphthalene	
61	171	n-ethyltoluene		98	240	C ₁₄ H ₃₀ isomer	
61A	172	C ₁₀ H ₂₂ isomer		101	240	C ₁₄ H ₂₈ isomer	
62	173	3-methylnonane		102A	240	n-butyl butyrate	525
62A	173	C ₁₀ H ₂₀ isomer		102	240	n-tetradecane	
63	174	cyanobenzene	1,169				
63A	175	phenol					
64	176	o-ethyltoluene					
65	177	C ₁₀ H ₂₀ isomer + octanal					
66	178	1,2,4-trimethylbenzene					
67	179	n-decane					
68	181	C ₁₀ H ₂₀ isomer					
69	182	m-dichlorobenzene					
69A	183	C ₁₀ H ₂₄ isomer					
69B	184	C ₁₂ H ₂₆ isomer					
70	185	C ₄ -alkyl benzene isomer					
71	186	1,2,3-trimethylbenzene					
71A	186	C ₁₁ H ₂₄ isomer					
72	187	C ₁₁ H ₂₂ isomer					
73	188	o-dichlorobenzene and C ₁₁ H ₂₄ isomer					
73A	188	n-butylcyclohexane					
73B	189	C ₁₁ H ₂₄ isomer					
74	189	p-propyltoluene					
75	191	C ₁₂ H ₂₆ isomer + C ₄ -alkyl benzene isomer					
76	192	acetophenone					
77	194	C ₁₁ H ₂₄ isomer					
77A	195	C ₁₁ H ₁₈ isomer					
78	196	C ₄ -alkyl benzene isomer					
78A	196	C ₄ -alkyl benzene isomer					
79	197	nonanal	2,661				
79A	198	C ₁₁ H ₂₂ isomer					
80	199	n-undecane					
81	200	C ₁₂ H ₂₆ (tent.)					
82	201	C ₁₂ H ₂₆ (tent.)					
83	204	methylundecane isomer					
84	209	dimethylphenol (tent.)					
85	211	C ₅ -alkyl benzene isomer					

^a Sampling was conducted on 6/29/76 from 1207 to 1359, see Table 15 for protocol (P1/L4).

Table A5. VOLATILE ORGANICS IN AMBIENT AIR UPWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	CO ₂		47	129	C ₈ H ₁₈ isomer	
2	43	CF ₂ Cl ₂		48	130	C ₈ H ₁₈ isomer	
3	47	propane		49	134	C ₈ H ₁₆ isomer	
4	56	acetaldehyde	trace	50	136	n-octane	
5	58	n-butane		51	138	N,N-dimethylformamide	
6	59	2-butane		52	140	tetrachloroethylene	1,187
7	59	isopentane		54	146	trimethylamine (tent.)	
9	62	furan		55	150	ethylbenzene	
10	63	C ₅ H ₁₀ isomer		56	152	p-xylene	
11	63	n-pentane		57	153	C ₉ H ₂₀ isomer	
12	64	isoprene		59	156	n-butyl formate	1,902
13A	67	propanal		60	157	3-methylhexanal	1,042
13B	67	acrolein	trace	61	160	m-xylene	
14	68	C ₅ H ₁₀ isomer		62	161	n-nonane	
15	70	methylene chloride	trace	63	162	C ₁₀ H ₂₂ isomer	
16	72	acetone		64	164	furfuryl alcohol	
17	77	isopropanol		65	165	C ₁₀ H ₂₂ isomer	
18	77	t-butanol		66	166	C ₁₀ H ₂₂ isomer	
19	82	2-methylpentane		67	167	2,3-benzofuran	
20	85	perfluorobenzene (aF)		68	169	C ₃ -alkyl benzene	
21	87	3-methylfuran		69	172	benzaldehyde	
22	88	3-methylpentane		70	174	C ₃ -alkyl benzene	
23	90	n-hexane		71	176	C ₁₁ H ₂₄ isomer	
24	91	chloroform	1,999	72	178	benzonitrile	2,892
25	92	methyl vinyl ketone		73	180	phenol	
26	93	methyl ethyl ketone		74	181	C ₃ -alkyl benzene	
27	94	perfluorotoluene (aF)		75	181	C ₃ -alkyl benzene	
28	95	C ₇ H ₁₆ isomer		76	182	C ₁₁ H ₂₄ isomer	
29	97	ethyl acetate	trace	77	182	dichlorobenzene	
30	98	1,2-dichloroethane	trace	78	183	C ₄ -alkyl benzene	
31	100	1,1,1-trichloroethane		79	183	C ₄ -alkyl benzene	
32	101	C ₇ H ₁₆ isomer		80	184	C ₁₂ H ₂₆ isomer	
33	102	benzene	7,718	81	184	C ₁₂ H ₂₄ isomer	
34	102	carbon tetrachloride	12,687	82	185	C ₃ -alkyl benzene	
35	103	cyclohexane		83	186	3-heptanol	
36	105	C ₇ H ₁₆ isomer		84	187	C ₁₁ H ₂₄ isomer	
37	106	C ₇ H ₁₆ isomer		85	188	C ₄ -alkyl benzene	
38	107	C ₇ H ₁₆ isomer		86	188	cresol isomer	
39	108	methylene dibromide	42	87	191	C ₄ -alkyl benzene	
40	109	C ₇ H ₁₆ isomer		88	192	C ₄ -alkyl benzene	
41	110	trichloroethylene	4,947	89	194	acetophenone	
42	112	n-heptane		90	197	2-methyl-2-pentanol (tent.)	
43	119	C ₈ H ₁₈ isomer		92	199	C ₁₁ H ₂₄ isomer	
44	120	C ₇ H ₁₄ isomer		93	200	C ₁₁ H ₂₄ isomer	
45	122	C ₈ H ₁₈ isomer		94	202	dimethylphenol isomer	
46	128	toluene		95	203	C ₁₂ H ₂₆ isomer	

(continued)

Table A5 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
96	205	C ₅ -alkyl benzene					
97	206	C ₄ -alkyl benzene					
98	208	dimethylphenol isomer					
99	210	dimethylphenol isomer					
100	213	C ₁₃ H ₂₆ isomer					
101	217	n-dodecane					
102	218	C ₁₂ H ₂₄ isomer					
103	219	naphthalene					
104	220	C ₄ -alkyl benzene					
105	222	C ₁₃ H ₂₆ isomer					
106	226	C ₁₂ H ₂₄ isomer					
107	228	phenyl phenol isomer					
108	230	dibenzofuran					
109	232	C ₆ -alkyl benzene					
110	234	n-tridecane					
111	238	2-methylnaphthalene					
112	239	diethylphthalate					
113	240	1-methylnaphthalene	440				
114	isothermal	C ₆ -alkyl benzene					
115	↓	C ₁₄ H ₃₀ isomer					
116	↓	C ₁₅ H ₃₂ isomer					
117	↓	unknown					
118	↓	n-tetradecane					
119	↓	C ₁₅ H ₃₂ isomer					
120	↓	unknown					
121	240	benzophenone	1,540				
122	isothermal	C ₁₅ H ₃₀ isomer					
123	↓	C ₁₅ H ₃₂ isomer					
124	↓	n-pentadecane					
126	↓	n-hexadecane					
127	↓	C ₁₇ H ₃₄ isomer					
128	↓	C ₁₇ H ₃₆ isomer					
129	↓	C ₁₇ H ₃₆ isomer					
130	↓	n-heptadecane					
131	↓	C ₁₇ H ₃₄ isomer					
132	↓	n-octadecane					

^a Sampling was conducted on 6/29/76 from 1607 to 1737, see Table 15 for protocol (P2/L1).

Table A6. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND OF
STAUFFER CHEMICAL CO^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	37	N ₂ , O ₂		49	98	benzene	14,093
2	38	C ₃ H ₆ isomer		50	100	trimethylpentane	
3	39	CO ₂		51	101	CCl ₄	13,687
4	42	CH ₃ Cl		52	101	cyclohexane	
6	44	C ₄ H ₁₀ isomer		53	102	C ₇ H ₁₆ isomer	
7	45	unknown		54	103	C ₇ H ₁₄ isomer	
8	47	acrylonitrile (tent.)		55	105	C ₇ H ₁₄ isomer	
9	48	unknown		56	105	C ₇ H ₁₆ isomer	
10	49	cyclobutane		57	106	C ₇ H ₁₄ isomer	
11	50	unknown		58	106	acetic acid (tent.)	
12	51	acetaldehyde	~7,000	59	107	trichloroethylene	4,500
13	54	vinyl ethyl ether		60	107	C ₇ H ₁₄ isomer	
14	57	unknown		61	108	C ₇ H ₁₆ isomer	
15	58	C ₅ H ₁₂ (isopentane)		62	108	C ₇ H ₁₄ isomer	
17	60	furan		63	110	C ₇ H ₁₄ isomer	
18	61	1-pentane		64	110	dimethylfuran	
19	61	1,2-epoxybutane (tent.)		65	110	dimethylhydrazine (tent.)	
20	62	cyclopentane		66	114	trimethylpentane	
21	62	propanol		67	115	C ₇ H ₁₄ isomer	
22	64	acrolein	714	68	116	C ₈ H ₁₆ isomer	
23	66	C ₅ H ₁₀ isomer		69	116	C ₈ H ₁₈ isomer	
24	67	dichloromethane	trace	70	117	C ₇ H ₁₄ isomer	
25	68	acetone		71	119	C ₈ H ₁₆ isomer	
26	71	C ₅ H ₁₀ isomer		72	124	toluene	
27	72	C ₇ H ₁₄ isomer		73	125	C ₈ H ₁₈ isomer	
28	74	C ₇ H ₁₄ isomer		74	126	C ₈ H ₁₈ isomer	
29	76	C ₇ H ₁₂ isomer		75	127	C ₈ H ₁₆ isomer	
30	77	C ₆ H ₁₄ isomer		76	128	C ₈ H ₁₆ isomer	
31	78	crotonaldehyde		77	128	C ₈ H ₁₄ isomer	
32	80	n-hexane		78	129	C ₇ H ₁₆ isomer	
33	82	perfluorobenzene (eW)		79	130	C ₈ H ₁₆ isomer	
34	84	methylpentane		80	132	C ₈ H ₁₈ isomer	
35	84	methyl furan		81	134	tetrachloroethylene	TRACE
36	84	2-methyl-2-propen-1-ol (?)		83	137	C ₈ H ₁₆ isomer	
37	84	C ₆ H ₁₄ isomer		84	137	C ₈ H ₁₂ isomer	
38	86	chloroform	trace	85	139	C ₉ H ₁₈ isomer	
39	86	unknown		86	141	C ₈ H ₁₆ isomer	
40	88	C ₇ H ₁₂ isomer		87	141	C ₉ H ₁₈ isomer	
41	88	ethyl hexanal		88	144	ethylbenzene	
42	89	C ₆ H ₁₂ isomer		89	146	C ₉ H ₁₈ isomer	
43	90	perfluorotoluene (eW)		90	147	C ₉ H ₂₀ isomer	
44	90	C ₇ H ₁₄ isomer		91	148	m- or p-xylene	
45	91	C ₇ H ₁₆ isomer		92	148	C ₇ H ₁₄ isomer	
46	93	1,2-dichloroethane	434	93	149	C ₉ H ₂₀ isomer	
47	93	tetrahydropyran		94	150	C ₉ H ₁₆ isomer	
48	94	1,1,1-trichloroethane		95	151	C ₉ H ₁₆ isomer	

(continued)

Table A6 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
96	152	cyclooctatetraene		140	189	C ₄ -alkyl benzene	
97	153	C ₉ H ₁₈ isomer		141	189	cresol	
98	154	<i>o</i> -xylene		142	190	C ₄ -alkyl benzene	
99	154	C ₉ H ₁₈ isomer		143	190	C ₁₀ H ₁₈ isomer	
100	154	C ₉ H ₂₀ isomer		144	190	C ₁₀ H ₂₂ isomer	
101	155	C ₉ H ₁₈ isomer		145	190	C ₁₁ H ₂₀ isomer	
102	158	C ₉ H ₁₈ isomer		146	192	C ₁₁ H ₂₀ isomer	
103	159	C ₉ H ₁₈ isomer		147	194	C ₄ -alkyl benzene	
104	160	C ₃ -alkyl benzene		148	194	<i>o</i> -methoxybenzaldehyde	
105	160	<i>p</i> -methyl benzyl alcohol (tent.)		149	196	C ₄ -alkyl benzene	
106	161	C ₁₀ H ₂₀ isomer		150	196	cresol	
107	163	C ₉ H ₂₀ isomer		151	196	C ₁₁ H ₂₄ isomer	
108	164	C ₉ H ₁₈ isomer		152	197	<i>o</i> -methyl anisole	
109	164	C ₁₀ H ₂₀ isomer		153	197	C ₃ -alkyl benzene	
110	165	C ₉ H ₂₀ isomer		154	199	1-phenyl-2-butene	
111	165	C ₉ H ₁₈ isomer		155	200	C ₄ -alkyl benzene	
112	165	C ₃ -alkyl benzene		156	201	ethylphenol	
113	165	benzaldehyde		157	203	ethylphenol	
114	167	C ₃ -alkyl benzene		158	204	C ₃ -alkyl benzene	
115	168	C ₁₂ H ₂₄ isomer		159	208	C ₃ -alkyl benzene	
116	169	2- <i>p</i> -propenylfuran (tent.)		160	208	dimethylphenol	
117	169	phenol		161	209	C ₃ -alkyl benzene	
118	169	2-ethyl-4-methylol-1,3- dioxolane (tent.)		162	210	diisopropylbenzene	
119	170	C ₃ -alkyl benzene		163	213	C ₁₃ H ₂₂ isomer	
120	170	hydroxybenzaldehyde		164	213	C ₁₂ H ₂₆ isomer	
121	170	benzyl bromide (tent.)		165	214	naphthalene	
122	171	unknown		166	214	C ₁₁ H ₁₆ isomer	
123	172	C ₉ H ₁₄ isomer		167	216	dimethylphenol	
124	173	C ₃ -alkyl benzene		168	218	unknown	
125	174	C ₁₀ H ₂₂ isomer		169	220	unknown	
126	175	<i>o</i> -chlorotoluene		170	221	C ₁₂ H ₂₆ isomer	
127	176	dichlorobenzene		171	224	dipropylene glycol methyl ether (tent.)	
128	177	C ₁₀ H ₂₀ isomer		172	225	C ₁₃ H ₂₄ isomer	
129	178	C ₃ -alkyl benzene		173	229	C ₁₃ H ₂₆ isomer	
130	179	C ₁₁ H ₂₀ isomer		174	230	C ₁₃ H ₂₈ isomer	
131	180	C ₃ -alkyl benzene		175	232	C ₁₄ H ₂₈ isomer	
132	180	C ₃ -alkyl benzene		176	233	methylnaphthalene	
133	182	dichlorobenzene		177	236	C ₁₅ H ₂₈ isomer	
134	183	<i>p</i> -cresyl acetate		178	237	dinonylphthalate (tent.)	
135	184	C ₄ -alkyl benzene		179	239	C ₁₅ H ₂₈ isomer	
136	185	C ₁₂ H ₂₆ isomer		180	240	C ₁₄ H ₂₆ isomer	
137	186	C ₄ -alkyl benzene		181	240	C ₁₃ H ₂₀ isomer	
138	187	C ₄ -alkyl benzene		182	240	C ₁₃ H ₂₈ isomer	
139	188	C ₃ -alkyl benzene		183	240	C ₁₆ H ₂₆ isomer	
				184	240	biphenyl	

(continued)

Table A6 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
185	240	C ₁₄ H ₃₀ isomer					
186	240	C ₁₆ H ₃₂ isomer					
187	240	C ₁₄ H ₂₆ isomer					
188	240	C ₁₇ H ₃₇ isomer					
189	240	C ₁₇ H ₃₂ isomer					
190	240	C ₁₄ H ₂₆ isomer					
191	240	C ₁₆ H ₃₄ isomer					
192	240	C ₁₅ H ₃₂ isomer					
193	240	C ₁₄ H ₂₆ isomer					
194	240	C ₁₄ H ₃₀ isomer					

^a Sampling was conducted on 6/29/76 from 1607 to 1737, see Table 15 for protocol (P2/L2).

Table A7. VOLATILE ORGANICS IN AMBIENT AIR DOWNWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	CO ₂		39	105	cyclohexane	
2	43	ethylene oxide		40	106	C ₇ H ₁₆ isomer	
3	46	CF ₂ Cl ₂		41	107	C ₇ H ₁₆ isomer	
4	50	cyclopropane		42	108	C ₇ H ₁₆ isomer	
5	52	propane		43	111	C ₇ H ₁₄ isomer	
6	53	2-methylpropane		44	113	trichloroethylene	3,263
7	56	acetaldehyde	-9,000	45	114	n-heptane	
8	57	n-butane		46	115	C ₇ H ₁₄ isomer	
9	58	2-butene		47	116	C ₇ H ₁₄ isomer	
10	62	isopentane		48	117	C ₈ H ₁₈ isomer	
11	64	CFCl ₃		49	120	C ₇ H ₁₄ isomer	
12	65	C ₅ H ₁₀ isomer		50	122	C ₇ H ₁₄ isomer	
13A	68	furan		51	123	C ₈ H ₁₆ isomer	
13B	68	C ₅ H ₁₀ isomer		52	123	C ₈ H ₁₈ isomer	
14	69	n-pentane		53	125	methyl isobutyl ketone	604
15	70	isoprene		54	126	C ₈ H ₁₆ isomer	
16A	71	propanal		55	128	isoamyl acetate (tent.)	
16B	71	acrolein	trace	56	131	toluene	
17A	73	methylene chloride	trace	57	133	C ₈ H ₁₈ isomer	
17B	73	diethyl ether		58	135	C ₈ H ₁₆ isomer	
18	75	1-chloropropane	28,667	59	139	n-octane	
19	75	C ₆ H ₁₄ isomer		60	140	C ₈ H ₁₆ isomer	
20	78	acetone		61	142	tetrachloroethylene	2,896
21A	80	isopropanol		63	144	C ₉ H ₂₀ isomer	
21B	80	t-butanol		64	146	C ₉ H ₂₀ isomer	
22	82	cyclopentane		65	147	C ₉ H ₁₈ isomer	
23	83	C ₆ H ₁₄ isomer		66	149	chlorobenzene	trace
24	84	C ₆ H ₁₂ isomer		67	150	C ₉ H ₁₈ isomer	
25	86	2-methylpentane		68	151	C ₉ H ₂₀ isomer	
26	88	perfluorobenzene (a#)		69	153	ethylbenzene	
27	89	3-methylfuran		70	154	C ₉ H ₂₀ isomer	
28	89	3-methylpentane		71	155	p-xylene	
29	90	n-hexane		72	158	C ₁₀ H ₂₂ isomer	
30	91	chloroform	trace	73	160	styrene	
31	91	C ₇ H ₁₆ isomer		74	161	o-xylene	
32A	92	methyl vinyl ketone	trace	75	162	n-nonane	
32B	92	methyl ethyl ketone	trace	76	163	C ₁₀ H ₂₂ isomer	
33	96	perfluorotoluene (a#)		77	164	C ₁₀ H ₂₀ isomer	
34	98	C ₇ H ₁₆ isomer		78	166	C ₁₀ H ₂₂ isomer	
35	99	1,2-dichloroethane	trace	79	167	cumene	
36A	100	1,1,1-trichloroethane		80	170	C ₁₀ H ₂₂ isomer	
36B	100	ethyl acetate		81	171	C ₁₀ H ₂₀ isomer	
37	101	C ₇ H ₁₆ isomer		82	172	alpha-pinene	
38	104	benzene	10,656	83	174	n-propylbenzene	
38A	104	C ₆ H ₁₆ isomer		84	175	benzaldehyde	
38B	104	carbon tetrachloride	7,250	85	176	C ₃ -alkyl benzene	

(continued)

Table A7 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
86	177	C ₃ -alkyl benzene	3,473	129	isothermal	C ₆ -alkyl benzene	
87	178	C ₁₁ H ₂₄ isomer		130		C ₁₄ H ₂₈ isomer	
88	179	phenol		131		C ₁₄ H ₃₀ isomer	
89	180	benzonitrile		132		n-tetradecane	
90	182	C ₁₁ H ₂₄ isomer		133		chlorotoluene isomer	
91A	183	C ₃ -alkyl benzene		134		2,3-diphenylfuran	
91B	183	n-decane		135		C ₁₅ H ₃₂ isomer	
92	185	C ₁₁ H ₂₄ isomer		137		n-pentadecane	
93	186	C ₁₁ H ₂₄ isomer		138		C ₁₆ H ₃₄ isomer	
94A	187	m-dichlorobenzene		139		C ₁₆ H ₃₄ isomer	
94B	187	C ₁₁ H ₂₄ isomer		140		C ₁₆ H ₃₂ isomer	
95	188	1,2,3-trimethylbenzene		141		C ₁₆ H ₃₄ isomer	
96	190	C ₁₁ H ₂₄ isomer		142		C ₁₆ H ₃₄ isomer	
97	192	C ₁₁ H ₂₄ isomer		143		n-hexadecane	
98	193	C ₁₁ H ₂₄ isomer					
99	193	C ₄ -alkyl benzene					
100A	195	C ₄ -alkyl benzene					
100B	195	acetophenone					
101	196	C ₄ -alkyl benzene					
102	198	cresol isomer					
103	200	C ₄ -alkyl benzene					
104	201	C ₄ -alkyl benzene					
105	203	n-undecane					
106	204	C ₁₂ H ₂₆ isomer					
107	206	C ₄ -alkyl benzene					
108	208	C ₁₂ H ₂₆ isomer					
109	208	C ₄ -alkyl benzene					
110	212	dimethylphenol isomer					
111	213	C ₄ -alkyl benzene					
112	215	dimethylphenol isomer					
113	217	C ₁₂ H ₂₆ isomer					
114	220	n-dodecane					
115	221	naphthalene					
116	222	C ₁₃ H ₂₈ isomer					
117	224	C ₄ -alkyl benzene					
118	226	C ₁₃ H ₂₈ isomer					
119	229	C ₅ -alkyl benzene					
120	232	C ₅ -alkyl benzene					
121	234	C ₅ -alkyl benzene					
122	236	C ₁₃ H ₂₆ isomer					
123	238	n-tridecane					
124	240	C ₁₃ H ₂₆ isomer					
125	isothermal	2-methylnaphthalene					
126		chlorotoluene isomer					
127		C ₆ -alkyl benzene					
128		C ₁₄ H ₃₀ isomer					

^a Sampling was conducted on 6/29/76 from 1607 to 1737, see Table 15 for protocol (P2/L3).

Table A8. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	41	N ₂ + O ₂		28	114	n-heptane	
2	43	CO ₂		28A	116	2-pentanone and C ₇ H ₁₄ isomer	
4	51	propane		28B	117	C ₇ H ₁₂ isomer	
5	53	1-butene		29	120	C ₈ H ₁₈ isomer	
5A	54	n-butane		30	121	methylcyclohexane	
5B	57	2-butene		30A	121	C ₈ H ₁₆ isomer	
6	57	acetaldehyde	trace	31A	122	C ₈ H ₁₈ isomer	
7	63	isopentane		31	123	2,4-dimethylhexane	
8A	65	C ₅ H ₁₀ isomer		31A	123	C ₈ H ₁₂ isomer	
8B	66	pentadiene		31B	124	C ₈ H ₁₈ isomer	
8C	66	furan and C ₅ H ₁₀ isomer		32	124	4-methyl-2-pentanone	
9	67	n-pentane		33	125	C ₈ H ₁₆ isomer	
10	70	propanal		34	127	C ₈ H ₁₆ isomer	
10A	71	C ₅ H ₁₀ isomer		34A	128	C ₈ H ₁₈ isomer	
11	72	acrolein	trace	34B	129	C ₈ H ₁₄ isomer	
11A	72	C ₅ H ₁₀ isomer		35	130	toluene	
11B	73	dichloromethane	trace	35A	131	C ₈ H ₁₈ isomer	
11C	75	diethyl ether		36	132	3-methylheptane	
12	76	acetone		36A		C ₈ H ₁₄ isomer	
12A	79	methyl propyl ether		37	135	dimethylcyclohexane	
13	80	2-methylpentane		38	137	hexanal	
14	83	2-methylpropanal		39	138	n-octane	
14A	84	3-methylpentane		39A	140	C ₈ H ₁₆ and C ₈ H ₁₄ isomer	
14B	85	C ₆ H ₁₂ isomer		40	141	tetrachloroethylene	
15	86	vinyl acetate		41A	144	n-butyl acetate (tent.)	
15A	87	hexafluorobenzene (eW)		42	146	hexanone	
16	96	methylcyclopentane and 2,4-dimethylpentane		43A	147	ethyl cyclohexane	
17	97	methyl ethyl ketone (tent.)		43	148	chlorobenzene	trace
18	98	1,2-dichloroethane and C ₇ H ₁₄ isomer	2,173	44	152	ethylbenzene	
19	99	1,1,1-trichloroethane		44A	153	C ₉ H ₁₈ isomer	
20	103	benzene and 3,3-dimethylpentane	11,343	44B	153	C ₉ H ₂₀ isomer	
21	104	carbon tetrachloride		45	154	m-xylene	
22A	105	cyclohexane		46	155	C ₉ H ₂₀ isomer	
23	106	2-methylhexane		46A	156	p-xylene	
24	107	2,3-dimethylpentane		47	158	3-heptanone (tent.)	
25	108	3-methylhexane		47A	158	C ₉ H ₁₆ isomer	
25A	109	C ₇ H ₁₄ isomer		48	159	styrene or cycloocta- tetraene and 2-heptanone	
25B	110	methyl isopropyl ketone		49	160	p-xylene and heptanone	
26	111	3-ethylpentane and 1,3- dimethylcyclopentane		49A	161	C ₉ H ₁₈ isomer	
27	112	1,3-dimethylcyclopentane		50	161	n-nonane	
27A	113	trichloroethylene	trace	50A	162	C ₁₀ H ₂₂ isomer	
27B	113	pentanal (tent.)		50B	164	C ₉ H ₁₈ isomer	
				51	166	C ₁₀ H ₂₀ isomer	
				51A	166	C ₁₀ H ₂₂ isomer	
				52	167	isopropylbenzene	

(continued)

Table A8 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
52A	1618	C ₉ H ₁₈ isomer		73	218	decanone	
53	1710	C ₁₀ H ₂₂ isomer		73A	219	C ₁₂ H ₂₂ isomer	
53A	1710	C ₃ -alkyl cyclohexane		74	220	decenal and C ₁₂ H ₂₄ isomer	
53B	171	octanone (tent.)		75	221	n-dodecane	
53C	172	n-propylbenzene and chlorotoluene		76	222	naphthalene	
54	174	benzaldehyde		77	224	C ₁₃ H ₂₈ isomer	
55	175	m-ethyltoluene		77A	225	C ₁₃ H ₂₆ isomer	
56	177	C ₁₀ H ₂₂ isomer		79	230	C ₁₃ H ₂₆ isomer	
56A	178	C ₁₀ H ₂₂ isomer		79A	231	C ₁₃ H ₂₈ isomer	
57	179	phenol		79B	232	undecanone (tent.)	
57A	179	cyanobenzene	trace	80	234	C ₁₅ H ₃₂ isomer	
57B	180	1,3,5-trimethylbenzene		81	236	2-undecanone	
58	181	octanal		82	237	tridecane	
59	182	1,2,4-trimethylbenzene and C ₁₀ H ₂₀ isomer		83	238	n-tridecane	
60	183	n-decane		84	240	8-methylnaphthalene	
61	184	m-dichlorobenzene		86	240	α-methylnaphthalene	
62	186	C ₁₁ H ₂₄ isomer		87	240	C ₁₄ H ₃₀ isomer	
63	188	1,2,3-trimethylbenzene		88	240	dodecanone	
64	191	o-dichlorobenzene		88A	240	C ₁₄ H ₂₈ isomer	
64A	192	C ₁₁ H ₂₄ isomer		89	240	n-tetradecane	
65	193	butylcyclohexane		89A	240	n-butyl butyrate	336
65A	193	C ₁₁ H ₂₄ isomer		89B	240	C ₁₅ H ₃₂ isomer	
66	194	sec-butylbenzene or p-propyltoluene		90	240	C ₁₆ H ₃₄ isomer	
66A	195	C ₄ -alkyl benzene		91	240	C ₁₅ H ₃₀ isomer	
67	196	acetophenone		92	240	C ₁₅ H ₃₀ isomer	
68	197	C ₁₁ H ₂₄ isomer and C ₄ - alkyl benzene		93	240	n-pentadecane	
68A	198	C ₄ -alkyl benzene and nonanone					
68B	199	C ₁₁ H ₂₀ isomer					
69	2101	nonanal					
69A	2101	C ₁₁ H ₂₂ isomer					
70	2102	n-undecane					
70A	2103	C ₅ -alkyl benzene					
70B	2105	C ₁₁ H ₂₂ isomer					
70C	2107	C ₄ -alkyl benzene					
70D	2110	C ₅ -alkyl benzene					
71A	2112	C ₁₂ H ₂₄ isomer and 1,2,3,4- tetrahydronaphthalene					
72	2114	C ₄ -alkyl benzene					
	2116	C ₄ -alkyl benzene					
	2117	C ₅ -alkyl benzene					

^a Sampling was conducted on 6/29/76 from 1607 to 1737, see Table 15 for protocol (P2/L4).

Table A9. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR UPWIND FROM
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	N ₂ + O ₂		29	113	trichloroethylene and n-pentane	3,737
2	44	CO ₂		30	114	n-heptane	
3	50	chloromethane		30A	115	C ₇ H ₁₄ isomer and 2-pentanone	1,742
4	51	propane		31	117	1-chloro-2-bromoethane	10,071
5	53	1-butene		31A	118	4-methyl-2-pentanone	trace
5A	54	n-butane		32	120	2,2-dimethylhexane	
6	57	acetaldehyde	~18,750	32A	121	C ₈ H ₁₄ isomer	
7	60	C ₅ H ₁₀ isomer		33	122	methylcyclohexane	
7A	61	isopentane		33A	122	C ₈ H ₁₆ isomer	
8	64	furan and C ₅ H ₁₀ isomer		34	123	C ₈ H ₁₈ isomer	
9	65	n-pentane		34A	124	2,4-dimethylhexane	
10	66	acrolein		35	126	3-methyl-2-pentanone (tent.) and C ₉ H ₂₀ isomer	
10A	66	propanal		35A	128	C ₉ H ₁₈ isomer	
10B	67	isopropene		36	129	1,1,1-trichloroethane	3,500
10C	67	dimethyl ether and C ₅ H ₁₀ isomer		37	130	toluene	
11A	68	dichloromethane	7,600	37A	131	C ₈ H ₁₈ isomer	
11	69	acetone		38	133	3-methylheptane	
12	70	ethanol or methyl propyl ether		38A	135	1-bromo-2-fluorobenzene and trifluorobromopropane (tent.)	
14	74	2-methylpentane		39	136	C ₈ H ₁₆ isomer	
15	75	2-methylpropanal		40	137	n-hexanal	
16	77	3-methylpentane		40A	138	dibromoethane isomer	591
16A	80	C ₆ H ₁₂ isomer		41	139	n-octane	
17	82	hexafluorobenzene (aE)		42	142	tetrachloroethylene	
17A	84	n-butanal and 3-methylfuran		43	145	trimethylhexane or C ₉ H ₂₀ isomer	
18	86	n-hexane		44	146	C ₉ H ₂₀ isomer	
18A	87	C ₆ H ₁₂ isomer		45	148	C ₉ H ₂₀ isomer	
19	88	chloroform	9,000	45A	149	C ₉ H ₁₈ isomer	
19A	90	methyl vinyl ketone	10,727	45B	150	ethylcyclohexane	
20	92	methyl ethyl ketone	14,556	45C	151	C ₉ H ₁₈ isomer	
20A	93	C ₆ H ₁₂ isomer		45D	152	C ₉ H ₁₈ isomer	
21	94	perfluorobenzene (aE)		46	153	ethylbenzene	
23	97	1,2-dichloroethane	37,913	46A	154	C ₉ H ₁₈ isomer	
23A	99	2-chloropropane (tent.)	4,067	46B	154	2-methyloctane or C ₉ H ₂₀ isomer	
24	103	benzene	8,687	47	155	n-xylene	
24A	104	carbon tetrachloride and C ₇ H ₁₆ isomer	3,875	47A	155	C ₉ H ₁₈ isomer	
24B	105	cyclohexane		48	156	3-ethylheptane	
25A	106	C ₇ H ₁₄ isomer		49	158	trimethylhexane isomer	
25	106	2-methylhexane		49A	159	styrene	
26	107	2,3-dimethylpentane		49B	159	C ₉ H ₂₀ isomer	
27	109	3-methylhexane		49C	160	heptanal	
27A	110	C ₇ H ₁₄ isomer		50	160	p-xylene	
27B	110	3-ethylpentane					
28	111	C ₇ H ₁₄ isomer					
28A	112	dimethylcyclopentane isomer					

(continued)

Table A9 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
51	161	C ₉ H ₁₈ isomer		79	215	dimethylphenol isomer	
52	162	n-nonane		80	219	C ₁₂ H ₂₄ isomer	
53	163	3,3,5-trimethylheptane		81	220	decanal	
54	164	bromo compound (tent.)		82	221	n-dodecane and naphthalene	
55	166	C ₁₀ H ₂₂ isomer		83	230	C ₃ -alkyl phenol (tent.)	
56	167	isopropylbenzene		84	240	tridecane	
56A	169	C ₁₀ H ₂₂ isomer		85	240	n-butyl-norbutyrate	
57	170	C ₁₀ H ₂₂ isomer		86	240	C ₁₆ H ₃₄ isomer	
57A	170	C ₁₀ H ₂₀ isomer		88	240	tridecanone (tent.)	
57B	171	C ₁₀ H ₂₀ isomer		89	240	C ₁₅ H ₃₀ isomer	
58	172	C ₁₀ H ₁₆ isomer		90	240	n-pentadecane	
58A	173	n-propylbenzene					
59	174	benzaldehyde					
60	175	m-ethyltoluene					
60A	176	C ₁₁ H ₂₄ isomer					
61	177	C ₁₀ H ₂₂ isomer					
61A	178	phenol					
62	179	C ₁₀ H ₂₂ isomer and o-ethyltoluene					
63	180	C ₁₀ H ₂₀ isomer and octanal					
64	181	1,2,4-trimethylbenzene					
65	183	n-decane					
65A	184	C ₁₀ H ₂₀ isomer					
66	185	C ₁₁ H ₂₄ isomer (tent.)					
66A	186	m-dichlorobenzene					
66B	187	C ₄ -alkyl benzene					
67	188	C ₁₁ H ₂₄ isomer					
68	189	C ₁₂ H ₂₆ isomer					
68A	189	1,2,3-trimethylbenzene					
69	190	C ₁₁ H ₂₄ isomer					
70	193	C ₁₁ H ₂₄ isomer					
70A	194	C ₆ -alkyl benzene isomer					
71	195	C ₄ -alkyl benzene isomer					
72	196	acetophenone					
73	197	C ₁₁ H ₂₂ isomer					
73A	198	nonanone (tent.)					
73B	199	C ₆ -alkyl benzene isomer					
73C	200	C ₁₁ H ₂₂ isomer					
74	201	nonanal					
75	203	n-undecane					
76	205	C ₁₂ H ₂₆ isomer					
76A	207	C ₆ -alkyl benzene isomer					
77	209	C ₄ -alkyl benzene isomer and ethylphenol					
78	212	dimethylphenol					
78A	214	C ₅ -alkyl benzene isomer					

^aSampling was conducted from 1029 to 1229 on 6/30/76, see Table 15 for protocol (P3/L1).

Table A10. VOLATILE ORGANICS IN AMBIENT AIR DOWNWIND FROM STAUFFER
CHEMICAL CO., EDISON, NJ^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	N ₂ + O ₂		24	120	methylcyclohexane	
2	43	CO ₂		24A	121	C ₈ H ₁₈ isomer	
3	50	chloromethane (tent.)		24B	122	2-methyl-3-pentanone	
3A	52	1-butene		24C	123	C ₈ H ₁₈ isomer	
3B	53	n-butane		25		C ₈ H ₁₈ isomer	
4	55	acetaldehyde	~51,250	25A	123	C ₈ H ₁₆ isomer	
5	59	isopentane		26	125	4-methyl-2-pentanone and C ₈ H ₁₆ isomer	
6	61	C ₅ H ₁₀ isomer		26A	126	C ₅ H ₁₀ O isomer	
6A	62	furan		26B	128	C ₈ H ₁₆ isomer	
6B	63	n-pentane		27	130	toluene	
6C	64	propanal		27A	131	2-methylheptane	
6D	64	acrolein	1,750	27B	131	4-methylheptane	
6E	67	dimethyl ether and dichloromethane		28	132	3-methylheptane	
7	68	acetone		28A	135	C ₈ H ₁₄ isomer	
7A	76	diethyl ether (tent.)	17,750	28B	136	C ₈ H ₁₆ isomer	
9	78	2-methylpentane		29	137	n-hexanal	
10	80	2-methylpropanal		30	139	n-octane	
11	84	3-methylpentane		31	141	tetrachloroethylene	
11A	85	methylpentene isomer and vinyl acetate	trace	31A	144	C ₈ H ₁₆ isomer	
12	87	hexafluorobenzene (eW)		32	146	C ₉ H ₂₀ isomer	
12A	88	n-hexane		32A	147	2,5-dimethylheptane	
13	90	chloroform	1,941	32B	147	ethylcyclohexane	
13A	91	methyl vinyl ketone	trace	33	148	chlorobenzene	167
13B	92	methyl ethyl ketone	trace	33A	151	C ₉ H ₁₈ isomer	
14	94	perfluorotoluene (eW)		34	153	ethylbenzene	
15	95	methylcyclopentane		34A	154	2-methyl octane or C ₉ H ₂₀ isomer	
16	98	1,1,1-trichloroethane		35	155	p or m-xylene	
17	102	benzene	6,875	36	156	3-ethylheptane or C ₉ H ₂₀ isomer	
17A	103	carbon tetrachloride	trace	36A	158	2-heptanone	
17B	104	cyclohexane		37	160	styrene and n-heptanal	
18	105	2-methylhexane		38	161	o-xylene	
19	106	2,3-dimethylpentane		38A	161	C ₉ H ₁₈ isomer	
20	108	3-methylhexane		39	162	n-nonane	
20A	109	C ₇ H ₁₄ isomer and 3- ethylpentane		39A	164	C ₉ H ₁₈ isomer	
21	110	dimethylcyclopentane isomer		39B	167	C ₁₀ H ₂₂ isomer	
21A	111	1,trans-2-dimethyl- cyclopentane		40	168	isopropylbenzene	
21B	111	trichloroethylene	trace	41	170	C ₁₀ H ₂₂ isomer	
22	112	n-pentanal	477	41A	174	n-propylbenzene	
23	113	n-heptane		42	175	benzaldehyde	
23A	114	2-pentanone	459	43	176	m-ethyltoluene	
23B	116	1,2-dichloroethane (tent.)	trace	44	177	C ₁₀ H ₂₂ isomer	
23C	119	n-propyl acetate	trace	45	178	C ₁₀ H ₂₂ isomer	
				45A	179	C ₁₀ H ₂₀ isomer	

(continued)

Table A10 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
45B	179	cyanobenzene		81	isothermal	n-hexadecane	
46	180	phenol					
46A	181	C ₁₀ H ₂₂ isomer					
47	182	octanal					
48	183	o-ethyltoluene					
49	184	n-decane					
50	185	benzylchloride	413				
51	186	m-dichlorobenzene					
51A	187	C ₁₁ H ₂₄ isomer and C ₄ - alkyl benzene isomer					
51B	188	C ₁₁ H ₂₄ isomer					
52	189	1,2,3-trimethylbenzene					
52A	190	C ₁₁ H ₂₄ isomer					
52B	191	o-dichlorobenzene					
52C	192	C ₁₁ H ₂₄ isomer					
52D	193	C ₁₁ H ₂₂ isomer and C ₄ - alkyl cyclohexane isomer					
53	195	m-diethylbenzene and n- butylbenzene					
53A	196	C ₁₁ H ₂₄ isomer					
54	197	acetophenone					
55	198	C ₁₁ H ₂₄ isomer					
56	200	C ₄ -alkyl benzene isomer					
56A	201	C ₄ -alkyl benzene isomer					
57	202	nonanal and C ₁₁ H ₂₄ isomer					
57A	203	C ₁₁ H ₂₂ isomer					
58	204	n-undecane					
59	209	C ₁₂ H ₂₆ isomer					
60	210	C ₅ -alkyl benzene isomer					
61	215	C ₄ -alkyl benzene isomer + C ₅ -alkyl benzene isomer					
61A	216	C ₁₂ H ₂₆ isomer					
62	218	C ₁₂ H ₂₄ isomer					
63	220	decanol (tent.) and C ₁₂ H ₂₄ isomer					
64	221	n-dodecane and naphthalene					
65	225	C ₁₃ H ₂₈ isomer					
66	230	C ₁₃ H ₂₆ isomer					
67	237	undecanone					
68	239	n-tridecane					
71	isothermal	n-tetradecane					
72		C ₁₁ H ₂₀ isomer (tent.)					
76		C ₁₆ H ₃₂ isomer (tent.)					
		C ₁₅ H ₃₀ isomer					
78		n-pentadecane					
79		C ₁₆ H ₃₄ isomer					

^aSampling was conducted on 6/30/76 from 1030 to 1230, see Table 15 for protocol (P3/L2).

Table A11. VOLATILE ORGANICS IN AMBIENT AIR DOWNWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	41	N ₂ + O ₂		19	110	3-ethylpentane and dimethyl- cyclopentane isomer	
2	43	CO ₂		19A	111	dimethylcyclopentane isomer	
3	48	propane		20	112	trichloroethylene	6,895
3A	49	1-butene		20A	112	C ₇ H ₁₄ isomer	
3B	50	n-butane		21	113	n-pentanal	
3C	51	2-butene		21A	114	n-pentane	
4	56	acetaldehyde	~4,500	21B	116	C ₇ H ₁₄ isomer and 2-pentanone	
5	59	isopentane		22	119	C ₈ H ₁₈ isomer	
6	62	furane		22A	119	C ₈ H ₁₆ isomer	
6A	63	C ₅ H ₁₀ isomer		23	120	methylcyclohexane	
6B	64	n-pentane and propanol		24	122	C ₈ H ₁₈ isomer	
6C	66	pentadiene		24A	123	C ₈ H ₁₈ isomer	
6D	67	propanal		25	124	4-methyl-2-pentanone	trace
6E	68	acrolein	trace		126	C ₈ H ₁₆ isomer	
6F	69	dichloromethane		26	129	toluene	
6G	71	dimethyl ether	trace	26A	130	C ₈ H ₁₈ isomer	
6H	72	acetone		27	132	C ₈ H ₁₈ isomer	
7	78	2-methylpentane		28	135	dimethylcyclohexane isomer	
7A	80	2-methylpropanal		29	137	C ₈ H ₁₆ isomer and hexanal	
8	82	3-methylpentane		29A	138	n-octane	
8A	83	vinyl acetate	trace	29B	140	n-butyl acetate	371
9	84	hexafluorobenzene (eW)		30	141	tetrachloroethylene	
9A	85	methylfuran		31	145	2-hexanone	
10	87	n-hexane		32	147	C ₉ H ₂₀ isomer	
10A	88	n-butanal		32	147	C ₉ H ₁₈ isomer	
11	89	chloroform	12,333	32B	148	C ₃ -alkyl cyclohexane isomer	
11A	90	C ₆ H ₁₂ isomer		32C	149	chlorobenzene (tent.)	480
11B	91	methyl vinyl ketone	trace	33	152	ethylbenzene	
11C	92	methyl ethyl ketone	trace	33A	153	C ₉ H ₂₀ isomer	
12	92	perfluorobenzene (eW)		34	154	p-xylene	
12A	93	C ₇ H ₁₆ isomer		35	155	C ₉ H ₂₀ isomer	
13	94	methylcyclopentane and C ₇ H ₁₆ isomer		35A	156	3-heptanone	
14	100	dichloroethane	trace	35B	157	2-heptanone	
14A	101	1,1,1-trichloroethane	19,167	36	158	cyclooctatetraene	
14B	102	methyl isopropyl ketone	trace	36A	159	heptanal	
14C	103	C ₇ H ₁₄ isomer and propyl acetate	trace	37	159	o-xylene	
15	103	benzene	5,906	37A	160	C ₉ H ₁₈ isomer	
15A	103	3,3-dimethylpentane		38	161	n-nonane	
15B	104	carbon tetrachloride		38A	162	C ₁₀ H ₂₂ isomer	
15C	104	cyclohexane		38B	163	C ₁₀ H ₂₂ isomer	
16	105	2-methylhexane		39	165	trimethylcyclohexane isomer	
17	106	2,3-dimethylpentane		39A	165	C ₁₀ H ₂₂ isomer	
18	107	3-methylhexane		40	166	isopropylbenzene	
18A	108	C ₇ H ₁₆ isomer		41	169	C ₁₀ H ₂₀ isomer	
				41A	171	C ₁₀ H ₂₀ isomer	

(continued)

Table All (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
42A	172	n-propylbenzene					
42	173	benzaldehyde					
43	174	m-ethyltoluene					
44	176	C ₁₀ H ₂₂ isomer					
44A	178	cyclohexene	trace				
45	179	phenol and p-ethyltoluene					
45A	179	C ₁₀ H ₂₂ isomer					
46	180	C ₁₀ H ₃₀ isomer and octanal					
47	181	o-ethyltoluene					
48	182	n-decane					
49A	183	1,2,4-trimethylbenzene					
48B	184	m-dichlorobenzene					
48C	187	C ₁₁ H ₂₄ isomer					
49	188	1,2,3-trimethylbenzene					
50	192	C ₁₁ H ₂₄ isomer					
50A	193	C ₄ -alkyl benzene isomer					
51	194	C ₄ -alkyl benzene isomer					
52	195	acetophenone					
53	196	C ₁₂ H ₂₆ isomer					
54	198	C ₄ -alkyl benzene isomer					
		C ₁₁ H ₂₀ isomer					
54A	199	C ₁₁ H ₂₂ isomer					
55	200	nonanal + C ₁₁ H ₂₄ isomer					
56	201	n-undecane					
56A	202	C ₁₂ H ₂₆ isomer					
57	206	C ₄ -alkyl benzene isomer					
59	217	decanone (tent.)					
59A	218	C ₁₂ H ₂₂ isomer					
60	219	decanal					
61	220	n-dodecane					
62	220	naphthalene					
64	233	C ₁₃ H ₂₈ isomer					
64A	234	C ₁₃ H ₂₆ isomer					
65	235	tridecane					
67	237	methylnaphthalene					
68	240	dodecanone (tent.)					
69		isothermal n-tetradecane					
69A		isothermal n-butyl-n-butyrate					
71		isothermal tridecanone					
72		isothermal C ₁₅ H ₃₀ isomer					
73		isothermal n-pentadecane					

^a Sampling was conducted on 6/30/76 from 1029 to 1229, see Table 15 for protocol (P3/L3).

Table A12. VOLATILE ORGANICS IN AMBIENT AIR DOWNWIND FROM
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	43	CO ₂		43	108	C ₇ H ₁₆ isomer	
2	47	CF ₂ Cl ₂		44	110	trichloroethylene	10,315
3	50	methylacetylene		45	111	n-heptane	
4	53	isobutene		46	117	C ₈ H ₁₈ isomer	
5	56	acetaldehyde	-6,250	47	118	C ₇ H ₁₄ isomer	
6	59	n-butane		48	121	C ₈ H ₁₈ isomer	
7	61	2-butene		49	122	methyl isobutyl ketone	3,077
8	62	C ₅ H ₁₀ isomer		50	123	C ₈ H ₁₆ isomer	
9	63	isopentane		51	125	C ₈ H ₁₆ isomer	
11	66	C ₅ H ₁₀ isomer		52	126	toluene	
12	67	furan		53	130	C ₈ H ₁₈ isomer	
13	68	n-pentane		54	132	C ₈ H ₁₆ isomer	
14	69	isoprene		55	133	n-hexanal	
15A	71	propanal		56	135	1,2-dibromoethane	trace
15B	71	acrolein	trace	57	136	n-octane	
16	73	methylene chloride		58	137	N,N-dimethylformamide	trace
17	74	diethyl ether	3,600	59	138	tetrachloroethylene	
18	75	3-chloropropene	trace	60	140	C ₉ H ₂₀ isomer	
19	76	acetone		61	142	C ₉ H ₂₀ isomer	
20	78	isopropanol		62	144	C ₉ H ₁₈ isomer	
21	79	C ₆ H ₁₄ isomer		63	146	chlorobenzene	1,807
22	80	C ₆ H ₁₄ isomer		64	150	ethylbenzene	
23	82	2-butenal	trace	65	152	p-xylene	
24	84	2-methylpentane		66	155	n-butylfuran	
25	85	C ₆ H ₁₄ isomer		67	156	styrene	
26	86	perfluorobenzene (eB)		68	157	o-xylene	
27A	87	vinylidene chloride (tent.)		69	158	C ₉ H ₁₈ isomer	
27B	87	2-methylfuran		70	159	n-nonane	
28	87	3-methylpentane		71	160	C ₁₀ H ₂₂ isomer	
29	88	n-hexane		72	163	C ₉ H ₁₈ isomer	
30	89	chloroform	3,445	73	164	cumene	
31	90	methyl vinyl ketone	2,100	74	165	C ₁₀ H ₂₂ isomer	
32	91	methyl vinyl ketone	1,278	75	166	C ₁₀ H ₂₂ isomer	
33A	92	perfluorotoluene (eB)		76	168	C ₉ H ₁₈ isomer	
33B	92	C ₇ H ₁₆ isomer		77	169	alpha-pinene	
34	94	methylcyclopentane		78	170	C ₁₀ H ₂₂ isomer	
35	95	1,2-dichloroethane	347	79	171	n-propylbenzene	
36	97	1,1,1-trichloroethane		80A	172	benzaldehyde	
37	98	ethyl acetate	trace	80B	172	C ₃ -alkyl benzene	
38A	101	benzene	8,968	81	174	C ₃ -alkyl benzene	
38B	101	C ₇ H ₁₆ isomer		82	175	phenol	
38C	101	carbon tetrachloride	2,000	83	176	benzonitrile	323
39	102	cyclohexane		84	177	C ₃ -alkyl benzene	
40	103	C ₇ H ₁₆ isomer		85	178	C ₁₀ H ₂₂ isomer	
41	104	C ₇ H ₁₆ isomer		86A	179	C ₃ -alkyl benzene	
42	105	C ₇ H ₁₆ isomer		86B	179	n-decane	

(continued)

Table A12 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
87	181	C ₁₁ H ₂₄ isomer		131	isothermal	n-tetradecane	
88	182	m-dichlorobenzene					
89	184	C ₁₁ H ₂₄ isomer					
90	185	C ₄ -alkyl benzene					
91	186	1,2,3-trimethylbenzene					
92	186	C ₁₁ H ₂₄ isomer					
93	187	C ₁₀ H ₁₆ isomer					
94	188	o-dichlorobenzene					
95	189	n-butylcyclohexane					
96	190	C ₁₁ H ₂₄ isomer					
97	191	C ₄ -alkyl benzene					
98A	192	C ₄ -alkyl benzene					
98B	192	acetophenone					
99	194	C ₄ -alkyl benzene					
100	196	C ₄ -alkyl benzene					
101	198	C ₄ -alkyl benzene					
102	199	n-undecane					
103	200	C ₁₁ H ₂₂ isomer					
104	202	C ₄ -alkyl benzene					
105	203	C ₁₂ H ₂₆ isomer					
106	205	C ₄ -alkyl benzene					
107	206	C ₅ -alkyl benzene					
108A	209	1,2,3,4-tetrahydronaphthalene					
108B	209	dimethylphenol isomer					
109	210	C ₄ -alkyl benzene					
110	213	C ₅ -alkyl benzene					
111	214	C ₁₂ H ₂₆ isomer					
112	216	C ₁₂ H ₂₆ isomer					
113	217	n-dodecane					
114	218	naphthalene					
115	220	C ₁₃ H ₂₈ isomer					
116	221	C ₁₃ H ₂₈ isomer					
117	224	C ₁₃ H ₂₆ isomer					
118	226	C ₁₃ H ₂₆ isomer					
119	229	C ₁₃ H ₂₈ isomer					
120	230	C ₁₃ H ₂₈ isomer					
121	232	C ₁₃ H ₂₈ isomer					
122	234	n-tridecane					
123	236	C ₁₃ H					
124	238	chlorotoluene isomer					
125	240	2-methylnaphthalene					
126	isothermal	C ₁₄ H ₃₀ isomer					
127		1-methylnaphthalene					
128		C ₁₄ H ₂₈ isomer					
129		C ₁₄ H ₃₀ isomer					
130		C ₁₄ H ₃₀ isomer					

^a Sampling was conducted on 6/30/76 from 1029 to 1229, see Table 15 for protocol (P3/L4).

Table A13. VOLATILE ORGANICS IN AMBIENT AIR UPWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	43	CO ₂		40	123	C ₈ H ₁₈ isomer	
3	48	propane		41	126	C ₈ H ₁₆ isomer	
4	52	isobutene		42	128	C ₈ H ₁₆ isomer	
5	56	acetaldehyde	~24,000	43	129	toluene	
6	64	isopentane		44	133	C ₈ H ₁₈ isomer	
8	67	furan		45	133	C ₈ H ₁₆ isomer	
9	68	n-pentane		46	135	C ₈ H ₁₆ isomer	
10A	69	C ₅ H ₁₀ isomer		47	137	C ₈ H ₁₆ isomer	
10B	69	isoprene		48	138	n-octane	
11	71	propanal		49	140	C ₈ H ₁₆ isomer	
12A	72	C ₅ H ₁₀ isomer		50	142	tetrachloroethylene	2,722
12B	72	methylene chloride	trace	51	145	C ₉ H ₂₀ isomer	
13	74	diethyl ether		52	146	C ₉ H ₁₈ isomer	
14	75	C ₆ H ₁₄ isomer		53	147	C ₉ H ₂₀ isomer	
15	76	acetone		54	148	chlorobenzene	1,127
16A	78	isopropanol		55	150	C ₉ H ₁₈ isomer	
16B	78	t-butanol		56	153	ethylbenzene	
17	80	C ₆ H ₁₄ isomer		57	154	C ₉ H ₂₀ isomer	
18	82	C ₆ H ₁₄ isomer		58	155	p-xylene	
19	84	2-methylpentane		59	158	C ₉ H ₁₈ isomer	
20	86	C ₆ H ₁₂ isomer		60	159	styrene	
21	88	perfluorobenzene (eW)		61	161	o-xylene	
22A	89	3-methylpentane		62	162	C ₉ H ₁₈ isomer	
22B	89	n-hexane		63	163	n-nonane	
23	92	chloroform	1,034	64	165	C ₁₀ H ₂₂ isomer	
24	94	C ₆ H ₁₂ isomer		65	166	C ₁₀ H ₂₂ isomer	
25A	96	perfluorotoluene (eW)		66	168	C ₁₀ H ₂₂ isomer	
25B	96	C ₇ H ₁₆ isomer		67	169	cumene	
26A	97	methyl ethyl ketone	5,111	68	170	C ₁₀ H ₂₂ isomer	
26B	97	C ₇ H ₁₆ isomer		69	171	C ₁₀ H ₂₀ isomer	
27	100	1,1,1-trichloroethane	trace	70	172	alpha-pinene	
28A	104	benzene		71	173	C ₁₀ H ₂₂ isomer	
28B	104	C ₇ H ₁₆ isomer		72	174	n-propylbenzene	
28C	104	carbon tetrachloride	1,937	73A	175	benzaldehyde	2,753
29A	106	cyclohexane		73B	175	C ₃ -alkyl benzene	
29B	108	C ₇ H ₁₆ isomer		74A	177	C ₃ -alkyl benzene	
30	109	C ₇ H ₁₆ isomer		74B	177	C ₁₁ H ₂₄ isomer	
31	112	C ₇ H ₁₆ isomer		75	178	phenol	
32	113	C ₇ H ₁₄ isomer		76A	180	benzonitrile	4,553
33	114	trichloroethylene	trace	76B	180	C ₃ -alkyl benzene	
34	115	n-heptane		77A	181	C ₃ -alkyl benzene	
35	116	C ₇ H ₁₄ isomer		77B	181	n-decane	
36	117	C ₇ H ₁₄ isomer		78	182	C ₁₁ H ₂₄ isomer	
37	118	C ₇ H ₁₄ isomer		79	183	C ₁₁ H ₂₄ isomer	
38	120	C ₈ H ₁₈ isomer		80	184	C ₁₁ H ₂₂ isomer	
39	122	C ₇ H ₁₄ isomer		81	186	C ₁₁ H ₂₄ isomer	

(continued)

Table A13 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
82	189	1,2,3-trimethylbenzene					
83	191	C ₁₁ H ₂₄ isomer					
84	192	methyl styrene isomer					
85	193	C ₄ -alkyl benzene					
86	195	C ₁₁ H ₂₂ isomer					
87	196	C ₄ -alkyl benzene					
88	197	acetophenone					
89	199	C ₄ -alkyl benzene					
90	201	C ₄ -alkyl benzene					
91	202	n-undecane					
92	205	cresol isomer					
93	208	C ₄ -alkyl benzene					
94	209	C ₁₂ H ₂₆ isomer					
95A	212	1,2,3,4-tetrahydronaphthalene					
95B	212	dimethylphenol isomer					
96	213	C ₄ -alkyl benzene					
97	217	C ₁₂ H ₂₆ isomer					
98	220	C ₁₂ H ₂₆ isomer					
99	221	n-dodecane					
100	222	naphthalene					
101	225	C ₁₃ H ₂₈ isomer					
102	226	C ₁₃ H ₂₈ isomer					
103	228	C ₁₃ H ₂₆ isomer					
104	232	C ₁₃ H ₂₆ isomer					
105	233	C ₁₃ H ₂₈ isomer					
106	234	C ₁₃ H ₂₈ isomer					
107	235	C ₁₃ H ₂₆ isomer					
108	236	C ₁₃ H ₂₈ isomer					
109	238	n-tridecane					
110	240	chlorotoluene isomer					
111	isothermal	2-methylnaphthalene					
112		1-methylnaphthalene					
113		C ₁₄ H ₃₀ isomer					
114		C ₆ -alkyl benzene					
115		C ₁₄ H ₃₀ isomer					
116		C ₁₄ H ₃₀ isomer					
117		n-tetradecane					
118		biphenyl					

^a Sampling was conducted on 6/30/76 from 1457 to 1646, see Table 15 for protocol (P4/L1).

Table A14. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND OF
STAUFFER CHEMICAL CO^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	CO ₂		43	121	dimethyldisulfide	
4	50	chloromethane		44	122	methyl isobutyl ketone	trace
4A	50	propane		45	123	C ₈ H ₁₆ isomer	
5	52	1-butene		46	126	C ₈ H ₁₆ isomer	
6	56	acetaldehyde	trace	47	128	toluene	
7	60	isopentane		48	131	C ₈ H ₁₈ isomer	
9	65	C ₃ H ₁₀ isomer		49	133	C ₈ H ₁₆ isomer	
10	66	furan		50	134	n-hexanal	
11	67	n-pentane		51	137	n-octane	
12	68	isoprene		52	139	tetrachloroethylene	527
12A	68	C ₃ H ₁₀ isomer		53	141	C ₈ H ₁₆ isomer	
13	70	propanal		54	142	C ₉ H ₂₀ isomer	
13A	70	acrolein	trace	55	144	C ₉ H ₂₀ isomer	
14	72	methylene chloride	trace	56	145	C ₈ H ₁₆ isomer	
15	74	acetone		57	146	chlorobenzene	trace
16	75	isopropanol		58	148	C ₉ H ₁₈ isomer	
17	78	C ₇ H ₁₄ isomer		59	151	ethylbenzene	
18	82	2-butenal		60	152	C ₉ H ₂₀ isomer	
19	83	2-methylpentane		61	153	p-xylene	
20	84	C ₆ H ₁₄ isomer		62	154	C ₉ H ₂₀ isomer	
21	86	perfluorobenzene (eB)		63	155	C ₈ H ₁₄ isomer	
22	87	2-methylfuran		64	156	n-butylfuran	
22A	87	3-methylpentane		65	158	styrene	
23	89	n-hexane		66	159	o-xylene	
24	91	chloroform	5,834	67	160	n-octane	
25	93	methyl ethyl ketone	trace	68	161	C ₉ H ₁₈ isomer	
25A	93	methyl vinyl ketone	trace	69	163	C ₁₀ H ₂₂ isomer	
26	94	perfluorotoluene (eB)		70	165	cumene	
27	95	C ₇ H ₁₆ isomer		71	167	C ₁₀ H ₂₂ isomer	
28	95	methylcyclopentane		72	168	alpha-pinene	
29	96	1,2-dichloroethane	trace	73	170	chlorotoluene isomer	
30	100	ethyl acetate	trace	73A	171	n-propylbenzene	
30A	100	1,1,1-trichloroethane		74	171	benzaldehyde	
31	102	benzene	24,718	74A	172	C ₃ -alkyl benzene	
32	102	carbon tetrachloride	1,875	75	174	C ₃ -alkyl benzene	
33	103	cyclohexane		76	175	C ₁₀ H ₂₂ isomer	
34	104	C ₇ H ₁₆ isomer		77	176	phenol	
34A	105	C ₇ H ₁₆ isomer		78	177	benzonitrile	trace
35	106	C ₇ H ₁₆ isomer		79	178	C ₃ -alkyl benzene	
36	109	C ₇ H ₁₄ isomer		79A	178	benzyl methyl ether	
37	111	trichloroethylene	394	79B	179	phenethyl alcohol (tent.)	
38	112	n-heptane		80	180	C ₃ -alkyl benzene	
39	113	C ₇ H ₁₄ isomer		80A	180	n-decane	
40	116	dimethylfuran isomer		81	182	benzylchloride	4,513
41	117	C ₈ H ₁₈ isomer		82	183	m-dichlorobenzene	
42	119	C ₇ H ₁₆ isomer		83	184	C ₄ -alkyl benzene	

(continued)

Table A14 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
84	185	C ₁₁ H ₂₄ isomer					
85	186	1,2,3-trimethylbenzene					
86	187	C ₁₁ H ₂₄ isomer					
87	188	o-dichlorobenzene					
88	189	C ₁₀ H ₂₀ isomer					
89	190	bromotoluene isomer					
90	191	bromotoluene isomer					
91	191	C ₄ -alkyl benzene					
92	192	C ₄ -alkyl benzene					
93	193	acetophenone					
94	194	C ₁₁ H ₂₄ isomer					
95	196	C ₄ -alkyl benzene					
96	198	C ₁₀ H ₁₆ isomer					
97	199	n-undecane					
98	201	C ₁₁ H ₂₂ isomer					
99	202	C ₁₂ H ₂₆ isomer					
100	204	isole (tent.)					
100A	204	C ₄ -alkyl benzene					
101	206	C ₄ -alkyl benzene					
102	207	dichlorotoluene					
103	208	C ₅ -alkyl benzene					
104	209	dimethylphenol					
105	211	C ₁₂ H ₂₄ isomer					
106	213	C ₅ -alkyl benzene					
107	214	C ₅ -alkyl benzene					
108	216	C ₁₃ H ₂₈ isomer					
109	218	n-dodecane					
110	219	naphthalene					
111	220	C ₅ -alkyl benzene					
112	221	C ₁₃ H ₂₈ isomer					
113	223	C ₆ -alkyl benzene					
114	226	C ₆ -alkyl benzene					
115	228	C ₁₃ H ₂₈ isomer					
116	230	C ₁₃ H ₂₆ isomer					
117	231	C ₁₃ H ₂₈ isomer					
118	232	C ₁₃ H ₂₈ isomer					
119	235	n-tridecane					
120	237	2-methylnaphthalene					
121	239	C ₁₄ H ₃₀ isomer					
122	240	1-methylnaphthalene					
123	240	C ₁₄ H ₂₈ isomer					
124	isothermal	C ₁₄ H ₃₀ isomer					
125	↓	C ₁₄ H ₃₀ isomer					
126	↓	C ₁₄ H ₃₀ isomer					
127	↓	n-tetradecane					

^a Sampling was conducted on 6/30/76 from 1458 to 1646, see Table 15 for protocol (P4/L2).

Table A15. VOLATILE ORGANICS IN AMBIENT AIR DOWNWIND FROM
KIN-BUC DUMP SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	44	CO ₂		41	120	methyl isobutyl ketone	3,472
3	55	acetaldehyde	~25,000	42	122	C ₈ H ₁₆ isomer	
4	60	isopentane		43	124	C ₈ H ₁₆ isomer	
6	63	C ₅ H ₁₀ isomer		44	127	toluene	
7	63	furan		45	130	C ₈ H ₁₈ isomer	
8	64	n-pentane		46	132	C ₈ H ₁₆ isomer	
9	65	isoprene		47	133	n-hexanal	trace
10A	66	propanal		48	134	1,2-dibromoethane	535
10B	66	acrolein		49	136	n-octane	
11	67	methylene chloride	trace	50	138	C ₈ H ₁₆ isomer	
12	68	diethyl ether		51	139	tetrachloroethylene	9,173
13	69	acetone		52	143	C ₉ H ₂₀ isomer	
14	70	3-chloropropene	2,428	53	145	C ₉ H ₂₀ isomer	
15	72	isopropanol		54	146	C ₉ H ₁₈ isomer	
16	74	C ₆ H ₁₄ isomer		55	147	chlorobenzene	607
17	78	C ₆ H ₁₄ isomer		56	150	ethylbenzene	
18	80	2-butenal		57	152	p-xylene	
19	82	2-methylpentane		58	156	n-butylfuran	
20	83	C ₆ H ₁₄ isomer		59	157	styrene	
21A	84	perfluorobenzene (aB)		60	158	o-xylene	
21B	84	2-methylfuran		61	159	C ₉ H ₁₈ isomer	
22	86	3-methylpentane		62	160	n-nonane	
23A	87	n-hexane		63	161	C ₁₀ H ₂₂ isomer	
23B	87	chloroform	8,999	64	162	C ₁₀ H ₂₂ isomer	
24	89	methyl ethyl ketone	trace	65	164	C ₁₀ H ₂₂ isomer	
25	90	methyl vinyl ketone	3,500	66	165	cumene	
25A	90	ethyl acetate	4,133	67A	166	C ₁₀ H ₂₂ isomer	
26A	92	perfluorotoluene (aB)		67B	166	2-ethylhexanal (tent.)	
26B	92	C ₇ H ₁₆ isomer		68	168	C ₁₀ H ₂₂ isomer	
27	93	C ₇ H ₁₆ isomer		69	169	C ₉ H ₁₈ isomer	
28	94	methyl cyclopentane		70	170	alpha-pinene	
29A	96	1,2-dichloroethane	1,130	71A	172	benzaldehyde	
29B	96	1,1,1-trichloroethane	7,684	71B	172	n-propylbenzene	
30A	100	benzene	5,375	72	174	C ₃ -alkyl benzene	
30B	100	C ₇ H ₁₆ isomer		73	175	C ₃ -alkyl benzene	
30C	100	carbon tetrachloride	7,625	74	176	phenol	
31	102	cyclohexane		75	177	benzonitrile	
32	103	C ₇ H ₁₆ isomer		76	178	C ₃ -alkyl benzene	
33	104	C ₇ H ₁₆ isomer		77	181	C ₃ -alkyl benzene	
34	105	C ₇ H ₁₆ isomer		78	182	n-decane	
35	108	C ₇ H ₁₆ isomer		79	183	C ₁₀ H ₂₀ isomer	
36	110	trichloroethylene	5,289	80	184	m-dichlorobenzene	
37	111	n-heptane		81	186	C ₁₁ H ₂₄ isomer	
38	114	C ₇ H ₁₄ isomer		82	187	1,2,3-trimethylbenzene	
39	116	C ₈ H ₁₈ isomer		83	188	m-dichlorobenzene	
40		C ₈ H ₁₄ isomer		84	190	n-butylcyclohexane	

(continued)

Table A15 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
85	191	C ₁₁ H ₂₄ isomer					
86	193	C ₄ -alkyl benzene					
87	194	acetophenone					
88	195	C ₄ -alkyl benzene					
89	198	C ₄ -alkyl benzene					
90	199	C ₄ -alkyl benzene					
91	200	n-undecane					
92	201	C ₃ -alkyl benzene					
93	202	C ₁₁ H ₂₂ isomer					
94	204	C ₁₂ H ₂₆ isomer					
95	205	C ₁₀ H ₁₂ isomer					
96	206	C ₄ -alkyl benzene					
97	208	C ₃ -alkyl benzene					
98	210	C ₁₂ H ₂₆ isomer					
99	211	C ₁₀ H ₁₂ isomer					
100	212	C ₃ -alkyl benzene					
101	214	C ₄ -alkyl benzene					
102	215	C ₃ -alkyl benzene					
103	218	C ₁₂ H ₂₆ isomer					
104	219	n-dodecane					
105	220	naphthalene					
106	221	C ₄ -alkyl benzene					
107	222	C ₁₃ H ₂₈ isomer					
108	224	C ₁₃ H ₂₈ isomer					
109	226	C ₆ -alkyl benzene					
110	228	C ₁₃ H ₂₈ isomer					
111	230	C ₁₃ H ₂₆ isomer					
112	232	C ₁₃ H ₂₈ isomer					
113	234	C ₁₃ H ₂₈ isomer					
114	236	n-tridecane					
115	238	chlorotoluene isomer					
116	240	2-methylnaphthalene					
117	isothermal	C ₁₄ H ₃₀ isomer					
118		1-methylnaphthalene					
119		C ₁₄ H ₂₈ isomer					
120		C ₁₄ H ₃₀ isomer					
121		C ₁₄ H ₃₀ isomer					
122		C ₁₄ H ₃₀ isomer					
123		n-tetradecane					
124		biphenyl ether					
125		n-pentadecane					
126		n-hexadecane					

^a Sampling was conducted on 6/30/76 from 1457 to 1646, see Table 15 for protocol (P4/L3).

Table A16. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND OF KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	41	N ₂ + O ₂		21	105	2-methylhexane	
2	43	CO ₂		22	106	2,3-dimethylpentane	
3	50	propane		23	107	3-methylhexane	
4	53	1-butene		24	109	3-ethylpentane	
4A	54	n-butane		24A	110	C ₇ H ₁₄ isomer	
4B	55	2-butene		25	111	1,cis-2-dimethylcyclopentane	
5	56-7	acetaldehyde	~14,000	25A	111	1,trans-2-dimethylcyclopentane	
5A	60	C ₅ H ₁₀ isomer		25B	112	trichloroethylene	trace
6	61	isopentane		26A	113	n-pentanal	
7	64	C ₅ H ₁₀ isomer		26	113	n-heptane	
7A	65	furan		26A	114	C ₇ H ₁₄ isomer	
7B	65	C ₅ H ₁₀ isomer		27	116	2-pentanone	
8	67	n-pentane		28	119	C ₈ H ₁₈ isomer	
9	68	propanal		28A	119	C ₈ H ₁₆ isomer	
9A	68	acrolein		29	120	methylcyclohexane	
9B	69	dichloromethane	trace	29A	121	C ₈ H ₁₆ isomer	
10	71	dimethyl ether		29B	121	C ₈ H ₁₈ isomer	
10A	71-2	acetone		30	122	2,4-dimethylhexane	
10B	79	methyl-n-propyl ether		31	124	4-methyl-2-pentanone	
10C	80	diethyl ether		32	127	C ₈ H ₁₆ isomer	
11	81	2-methylpentane		33	128-9	toluene	
12	83	2-methylpropanal		33A	129	C ₈ H ₁₈ isomer	
12A	84	3-methylpentane		34	131	3-methylheptane	
12B	85	C ₆ H ₁₂ isomer		34B	134	dimethylcyclohexane isomer	
12C	86	vinyl acetate		34C	135	C ₈ H ₁₆ isomer	
13	87	hexafluorobenzene (eW)		35	136	n-hexanal	800
13A	87	3-methylfuran (tent.)		36	137	n-octane	
14	88	n-hexane		36A	139	C ₈ H ₁₆ isomer	
15	91	chloroform	2,778	37	140	tetrachloroethylene	1,389
15A	91	diisopropyl ether (tent.)		37A	141	n-butyl acetate	
15B	92	methyl vinyl ketone	trace	38	143	3-hexanone	
16A	93	methyl ethyl ketone	trace	38A	144	2-hexanone	
16	94	perfluorotoluene (eW)		39	147	C ₉ H ₂₀ isomer	
16B	94	2,2,3-trimethylbutane		39A	147	ethylcyclohexane	
16C	95	C ₇ H ₁₆ isomer		40	148	chlorobenzene	610
17	95	methylcyclopentane		41	152	ethylbenzene	
17A	96	ethyl acetate	trace	41A	152	C ₉ H ₁₈ isomer	
17B	96	C ₇ H ₁₆ isomer		41B	153	C ₉ H ₂₀ isomer	
18A	97	methyl isopropyl ketone (tent.) and C ₇ H ₁₆ isomer		42	154	m-xylene	
18	98	1,1,1-trichloroethane		42A	154	C ₉ H ₂₀ isomer	
19	100	isopropyl acetate		43	155	3-heptanone (tent.)	
20	102	benzene and 3,3-dimethylpentane	10,031	43A	156	C ₁₀ H ₂₂ isomer	
20A	103	carbon tetrachloride	trace	44	157	2-heptanone	
20B	104	cyclohexane		45	158	cyclooctatetraene and C ₉ H ₁₈ isomer	
				46	159	heptanal and C ₉ H ₂₀ isomer	713

(continued)
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Table A16 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
46A	159	<i>o</i> -xylene		69A	202	C ₁₁ H ₂₂ isomer	
46B	160	C ₉ H ₁₈ isomer		69B	203	C ₁₂ H ₂₆ isomer	
47	161	<i>n</i> -nonane		70	204	C ₄ -alkyl benzene isomer	
48	161	3,3,5-trimethylheptane		71	207	C ₄ -alkyl benzene isomer	
49	165	C ₁₀ H ₂₂ isomer		71A	210	C ₁₂ H ₂₄ isomer	
50	166	isopropylbenzene		72A	211	1,2,3,4-tetrahydronaphthalene	
50A	167	C ₁₀ H ₂₂ isomer		72B	212	C ₁₂ H ₂₆ isomer	
51	168	C ₁₀ H ₂₂ isomer		73	213	C ₄ -alkyl benzene isomer	
51A	169	C ₃ -alkylcyclohexane isomer		73A	214	C ₅ -alkyl benzene isomer	
51B	170	C ₁₀ H ₂₀ isomer and C ₁₀ H ₂₂ isomer		74B	215	C ₅ -alkyl benzene isomer	
52	171	C ₁₀ H ₁₆ isomer		74	216	decanone	
52A	172	<i>n</i> -propylbenzene		74A	218	C ₁₂ H ₂₄ isomer	
53	173	benzaldehyde	ng ^b	75	218	decanal	
54	174	<i>m</i> -ethyltoluene		76	219	<i>n</i> -dodecane	
55	175	C ₁₀ H ₂₂ isomer		77	220	naphthalene	
56	177-9	phenol		78	222	C ₁₃ H ₂₈ isomer	
57	179	cyanobenzene (tent.) and C ₁₀ H ₂₂ isomer		79	224	C ₁₃ H ₂₆ isomer	
58	180	octanal		79A	235	undecanone	
58A	180	C ₁₀ H ₂₀ isomer		79B	236	C ₁₃ H ₂₆ isomer	
59	181	1,2,4-trimethylbenzene		80	237	<i>n</i> -tridecane	
59A	182	<i>n</i> -decane		81	240	<i>β</i> -methylnaphthalene	
60	183	C ₁₁ H ₂₄ isomer		82	240	<i>α</i> -methylnaphthalene	
61	187	C ₁₁ H ₂₄ isomer		83	240	C ₁₄ H ₂₈ isomer	
61A	187	1,2,3-trimethylbenzene and C ₄ -alkyl benzene isomer		84	240	C ₁₅ H ₃₀ isomer	
62	188	C ₁₁ H ₂₄ isomer		84A	240	C ₁₄ H ₂₈ isomer	
62A	189	C ₁₂ H ₂₄ isomer		85	240	<i>n</i> -tetradecane	
63	190	<i>o</i> -dichlorobenzene		86	240	C ₁₆ H ₃₄ isomer	
63A	191	butylcyclohexane					
64	192	C ₁₁ H ₂₄ isomer					
64A	192	<i>p</i> -propyltoluene					
64B	193	<i>n</i> -butylbenzene					
65	194	C ₁₁ H ₂₄ isomer					
66	195	acetophenone					
67	196	C ₁₂ H ₂₆ isomer					
67A	197	C ₄ -alkyl benzene isomer					
67B		and nonanone					
67C	198	C ₁₁ H ₂₂ isomer					
	199	C ₁₁ H ₂₂ isomer					
68	200	<i>n</i> -nonanal	2,265				
69	201	<i>n</i> -undecane					

^aSampling was conducted on 6/30/76 from 1457 to 1528, see Table 15 for protocol (P4/L4).

^bNot quantitated (interference).

Table A17. VOLATILE ORGANICS IN AMBIENT AIR UPWIND FROM
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	N ₂ + O ₂		22A	108	dimethylcyclopentane isomer	
2	43	CO ₂ isomer		23	110	dimethylcyclopentane isomer and 3-ethylpentane	
3	51	propane		23A	111	dimethylcyclopentane	
3A	52	1-butene		24	112	trichloroethylene	
3B	53	n-butane		25	114	n-heptane	
3C	54	2-butene		26	115	pentanal	
3D	55	chloromethane (tent.)		26A	116	C ₇ H ₁₄ isomer	
4	56	acetaldehyde	trace	26B	117	2-pentanone	
6	62	isopentane		27	119	C ₈ H ₁₈ isomer	
7	66	uran		28	120	methylcyclohexane	
7A	67	C ₅ H ₁₀ isomer		28A	121	C ₈ H ₁₆ isomer	
8	68	n-pentane		28B	121	C ₈ H ₁₈ isomer	
8A	68	C ₅ H ₁₀ isomer and pentadiene isomer		29	122	2,4-dimethylhexane	
8B	69	propanol		29A	123	C ₈ H ₁₆ isomer	
8C	70	acrolein	trace	29B	124	C ₈ H ₁₈ isomer	
8D	71	C ₅ H ₁₀ isomer		30	125	4-methyl-2-pentanone	
8E	72	dichloromethane	trace	30A	125	C ₈ H ₁₆ isomer	
8F	72	diethyl ether		30B	126	cyclopentanone (tent.)	
9	74-8	acetone		31	129-30	toluene	
9A	74	2,2-dimethylbutane		31A	130	C ₈ H ₁₈ isomer	
9B	76	methyl propyl ether (tent.)		31B	131	C ₈ H ₁₆ isomer	
9C	80	C ₆ H ₁₂ isomer		32	132	3-methylheptane	
10	80	2-methylpentane		33	135	dimethylcyclohexane isomer	
11	83	2-methylpropanal		33A	135	C ₈ H ₁₂ O isomer	
11A	84	3-methylpentane		33B	137	hexanal	
11B	85	C ₆ H ₁₂ isomer		34	138	n-octane	
11C	86	vinyl acetate		34A	140	C ₈ H ₁₆ isomer	
12	87	hexafluorobenzene (eW)		34B	141	3-hexanone	
13	88	n-hexane		35	142	tetrachloroethylene	1,360
14	90	chloroform	17,222	35A	146	C ₉ H ₂₀ isomer	
15	92	butanal		35B	141	3-hexanone	
15A	93	methyl ethyl ketone	trace	35C	148	ethyl cyclohexane	
16	95	perfluorotoluene (eW)		35D	149	chlorobenzene	
16A	95	C ₇ H ₁₆ isomer		35E	151	C ₉ H ₁₈ isomer	
17	96	methyl cyclopentane		36	153	ethylbenzene	
18	98	C ₈ H ₁₆ isomer and 1,1,1- trichloroethane	trace	36A	154	C ₉ H ₂₀ isomer	
18A	99	ethyl acetate		37	155	m-xylene	
19	102-3	benzene	15,969	37A	156	C ₉ H ₁₈ isomer	
19A	103	C ₇ H ₁₆ isomer		37B	156	C ₉ H ₂₀ isomer	
19B	104	carbon tetrachloride		37C	157	p-xylene	
19C	105	C ₇ H ₁₄ and cyclohexane		37D	157	3-heptanone	
20	105	2-methylhexane		37E	158	C ₉ H ₁₆ isomer and 2-heptanone	
21	106	2,3-dimethylpentane		38	159	cyclooctatetraene	
22	107	3-methylhexane		38A	159	C ₉ H ₂₀ isomer	
				39	160	p-xylene and heptanal	

(continued)

Table A17 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
40	162	n-nonane		62	238	n-tridecane	
40A	163	C ₁₀ H ₂₂ isomer		62A	240	8-methylnaphthalene	
41	165	C ₁₀ H ₂₀ isomer		63	240	n-tetradecane	
41A	166	C ₁₀ H ₂₂ isomer		63A	240	n-butylbutyrate	trace
42	167	isopropylbenzene					
42A	168	C ₁₀ H ₂₀ isomer and octanone isomer					
43	170	C ₁₀ H ₂₂ isomer					
43A	170	C ₃ -alkyl cyclohexane isomer					
43B	172	2-octanone					
43C	173	n-propylbenzene					
44	174	benzaldehyde	trace				
45	175	m-ethyltoluene					
46	177	C ₁₀ H ₂₂ isomer					
46A	178	C ₁₀ H ₂₂ isomer					
46B	179	C ₁₀ H ₂₂ isomer					
47	180	cyanobenzene and phenol					
47A	180	1,3,5-trimethylbenzene					
47B	181	C ₁₀ H ₂₂ isomer					
48	181	octanal					
49	182-3	1,2,4-trimethylbenzene and m- decane					
49A	184	m-dichlorobenzene					
49B	186	C ₁₁ H ₂₄ isomer					
50	189	1,2,3-trimethylbenzene					
50A	190	C ₁₁ H ₂₄ isomer					
50B	192	C ₁₁ H ₂₂ isomer					
50C	193	C ₄ -alkylcyclohexane					
50D	193	nonanal isomer and indane					
51	194	sec-butylbenzene or p-propyl- toluene					
51A	195	C ₄ -alkyl benzene isomer					
52	196	acetophenone					
53	197	C ₁₁ H ₂₄ isomer					
54	199	C ₄ -alkyl benzene and nonanone isomer					
54A	200	C ₄ -alkyl benzene isomer					
55	201	1-nonanal					
56	202	n-undecane					
56A	207	C ₄ -alkyl benzene isomer					
57	212	1,2,3,4-tetrahydronaphthalene					
57A	217	C ₃ -alkyl benzene isomer					
57B	218	decanone					
58	220	decanal					
59	221	n-dodecane and naphthalene					
61	236	undecanone isomer					

^a Sampling was conducted on 7/1/76 from 1006 to 1206, see Table 15 for protocol (P5/L1).

Table A18. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND OF
STAUFFER CHEMICAL PLANT^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	N ₂ + O ₂		21	1-7	trichloroethylene	
1A	43	CO ₂		22	109	n-pentanal and n-heptane	
2	50	propane		22A	112	2-pentanone	
3	51	1-butene		22B	114	C ₈ H ₁₈ isomer	
3A	51	n-butane		23	116	methylcyclohexane	
3B	52	2-butene		23A	117	C ₈ H ₁₈ isomer	
4	55	acetaldehyde	-20,833	23B	118	C ₈ H ₁₆ isomer	
5	59	isopentane		24	119	C ₈ H ₁₈ isomer and 3-methyl-2- pentanone	
5A	62	C ₅ H ₁₀ isomer		24A	121	4-methyl-2-pentanone	
5B	63	pentadiene		25	125	toluene	
5C	63	furan and C ₅ H ₁₀ isomer		27	128	C ₈ H ₁₈ isomer	
6	64	n-pentane		27A	129	C ₈ H ₁₄ isomer	
7	64	propanal and acrolein	3,125	27B	130	C ₈ H ₁₆ isomer	
7A	66	C ₅ H ₁₀ isomer and dimethyl ether		27C	132	C ₈ H ₁₆ isomer	
8A	67	dichloromethane		28	133	hexanal	1,200
8	68-70	acetone		29	135	n-octane	
8A	68	methyl-n-propyl ether		30	138	tetrachloroethylene	
8B	69	diethyl ether		31	140	cyclopentane	
8C	69	C ₆ H ₁₂ isomer		31A	140	C ₈ H ₁₆ isomer	
9	70	2-methylpentane		32	141	2-ethylbutyraldehyde	
10	71	2-methylpropanal		33	142	C ₉ H ₂₀ isomer	
10A	72	C ₆ H ₁₂ isomer and 3-methyl- pentane		33A	144	2-hexanone	
10B	77	1-hexene or C ₆ H ₁₂ isomer		34	148	C ₈ H ₁₂ isomer	
10C	79	vinyl acetate		35	149	ethylbenzene	
11	82	hexafluorobenzene (a#)		35A	150	2,5-dimethyl-hexa-2,4-diene	
12	83	n-hexane		35B	151	C ₉ H ₂₀ isomer	
12A	84	butanal		36	152	m-xylene	
13	85	chloroform	11,111	36A	153	C ₉ H ₂₀ isomer	
14	89	methyl ethyl ketone and methyl vinyl ketone (tent.)		37	153	C ₉ H ₂₀ isomer	
14A	89	perfluorotoluene (a#)		38	156	C ₉ H ₁₆ isomer and 2-heptanone	
15	90	methylcyclopentane		39	157	cyclooctatetraene	
15A	93	1,1,1-trichloroethane		39A	157	heptanal	
15B	95	3,3-dimethylpentane		40	158	o-xylene	
16	97-9	benzene	7,343	40A	158	C ₉ H ₁₈ isomer	
16A	98	carbon tetrachloride		41	159	n-nonane	
16B	98	thiophene		41A	161	C ₃ -alkylcyclohexane isomer	
17	100	cyclohexane and 2-methylhexane		41B	162	C ₁₀ H ₂₂ isomer	
18	101	2,3-dimethylpentane		41C	163	C ₉ H ₁₈ isomer	
19	103	3-methylhexane		42	164	isopropylbenzene	
19A	104	C ₇ H ₁₄ isomer		43	166	C ₇ H ₁₄ O isomer and C ₉ H ₁₈ isomer	
20	105	dimethylcyclopentane isomer and 3-ethylpentane		44	167	C ₁₀ H ₂₂ isomer	
20A	106	dimethylcyclopentane isomer		44A	169	octanone	
				44B	170	chlorotoluene (isomer)	
				45	171	benzaldehyde	3,400
				45A	172	n-propylbenzene	

(continued)
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Table A18 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
45B	172	p-ethyltoluene					
45C	173	C ₁₀ H ₂₂ isomer					
46	174	C ₁₀ H ₂₂ isomer					
46A	176	cyanobenzene					
47	177	o-ethyltoluene and 2-octanone					
47A	178	phenol					
48	179	octanal	1,330				
48A	180	1,2,4-trimethylbenzene					
49	181	n-decane					
49A	182	C ₁₁ H ₂₄ isomer					
50	183	benzyl chloride	6,540				
50A	184	dichlorobenzene (m or p)					
50B	185	C ₁₁ H ₂₄ isomer					
51	186	1,2,3-trimethylbenzene and C ₁₀ H ₂₀ isomer					
51A	188	C ₁₁ H ₂₂ isomer					
51B	189	C ₁₁ H ₂₄ isomer					
52	191	bromotoluene (m or p)	472				
53	194	acetophenone					
54	197	2-nonanone					
55	199	n-nonanal	3,080				
56	201	n-undecane					
57	207	C ₁₂ H ₂₆ isomer					
58	210	1,2,3,4-tetrahydronaphthalene					
59	213	C ₆ -alkyl benzene isomer					
59A	215	C ₆ -alkyl benzene isomer					
60	216	decanone and terphthaldehyde (tent.)					
61	217	C ₁₂ H ₂₄ isomer and C ₆ -alkyl benzene isomer					
62	218	decenal					
63	219	n-dodecane and naphthalene					
63A	224	C ₁₂ H ₂₆ isomer					
63B	227	naphthol isomer					
63C	233	C ₁₃ H ₂₈ isomer					
65	235	C ₁₃ H ₂₆ isomer					
66	237	n-tridecane					
67	240	C ₁₄ H ₃₀ isomer					
70	240	n-tetradecane					

^a Sampling was conducted on 7/1/76 from 1006 to 1206, see Table 15 for protocol (P5/L2).

Table A19. VOLATILE ORGANICS IN AMBIENT AIR ON
KIN-BUC DUMP SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	CO ₂		43	115	dimethylfuran isomer	
3	52	C ₄ H ₈ isomer		45	119	C ₇ H ₁₄ isomer	
4	56	acetaldehyde	trace	46	122	C ₈ H ₁₈ isomer	
5	57	n-butane		47	122	methyl isobutyl ketone	
6	58	methylchloride (tent.)		48	123	C ₈ H ₁₆ isomer	
7	59	isopentane		49	126	C ₈ H ₁₆ isomer	
9A	61	C ₅ H ₁₀ isomer		50	128	toluene	
9B	61	furan		51	129	C ₈ H ₁₈ isomer	
10	62	n-pentane		51	130	C ₈ H ₁₈ isomer	
11A	63	isoprene		53	132	C ₈ H ₁₆ isomer	
11B	63	C ₅ H ₁₀ isomer		54	133	n-hexanal	
12	64	propanal		55	135	1,2-dibromoethane	737
13	65	acrolein	trace	56	136	n-octane	
14	68	methylene chloride	40,000	57	138	C ₈ H ₁₆ isomer	
15	69	diethyl ether		58	140	tetrachloroethylene	23,560
17	72	acetone		59	141	C ₉ H ₂₀ isomer	
18	76	isopropanol		60A	142	C ₉ H ₂₀ isomer	
19	78	C ₈ H ₁₆ isomer		60B	142	trimethylfuran isomer	
20	80	C ₈ H ₁₆ isomer		61	145	C ₉ H ₁₈ isomer	
21	82	2-butenal		62	146	chlorobenzene	
22	83	2-methylpentane		63	148	C ₉ H ₁₈ isomer	
23	84	C ₈ H ₁₆ isomer		64	151	ethylbenzene	
24	87	perfluorobenzene (eB)		65	152	C ₉ H ₁₈ isomer	
25A	88	3-methylpentane		66	152	p-xylene	
25B	88	n-hexane		67	154	n-butylfuran	
25C	88	2-methylfuran		68	156	styrene	
26	89	1,3-dioxane (tent.)		69	158	p-xylene	
27	90	chloroform	19,444	70	159	n-nonane	
28	91	methyl ethyl ketone	8,335	71	160	C ₉ H ₁₈ isomer	
29	93	methyl vinyl ketone	trace	72	163	C ₉ H ₁₈ isomer	
30A	94	perfluorotoluene (eB)		73	164	cumene	
30B	94	C ₇ H ₁₆ isomer		74	167	C ₁₀ H ₂₂ isomer	
31	95	methylcyclopentane		75	168	C ₉ H ₁₈ isomer	
32	96	1,2-dichloroethane	7,575	76	170	o-pinene	
33	98	1,1,1-trichloroethane	3,417	77	171	p-propylbenzene	
34	99	ethyl acetate		78A	173	benzaldehyde	
35A	100	benzene		78B	173	C ₅ -alkyl benzene	
35C	100	carbon tetrachloride		79	174	C ₅ -alkyl benzene	
36	101	cyclohexane		80	175	phenol	
37	103	C ₇ H ₁₆ isomer		81	176	benzocyclopentadiene	
38	107	C ₇ H ₁₆ isomer		82	177	C ₅ -alkyl benzene	
39	108	C ₇ H ₁₆ isomer		83	178	C ₁₀ H ₂₂ isomer	
40	111	trichloroethylene	18,940	84A	180	C ₅ -alkyl benzene	
41	112	p-limonene		84B	180	p-dioxane	
42	113	C ₇ H ₁₆ isomer		85	181	C ₁₀ H ₂₂ isomer	

(continued)

Table A19 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
86A	182	C ₄ -alkyl benzene		130	isothermal	C ₁₄ H ₃₀ isomer	
86B	182	m-dichlorobenzene		131		C ₁₄ H ₃₀ isomer	
87	184	C ₁₁ H ₂₄ isomer		132		C ₁₄ H ₃₀ isomer	
88	185	C ₁₁ H ₂₄ isomer		133		n-tetradecane	
89	186	1,2,3-trimethylbenzene		134		biphenyl	
90	187	C ₄ -alkyl benzene		135		diphenyl ether	
91	188	C ₁₀ H ₁₆ isomer		137		n-pentadecane	
92	189	p-dichlorobenzene		138		n-hexadecane	
93	190	C ₁₀ H ₂₀ isomer					
94	191	C ₄ -alkyl benzene					
95	192	C ₄ -alkyl benzene					
96	193	C ₄ -alkyl benzene					
97	194	C ₄ -alkyl benzene					
98	196	C ₄ -alkyl benzene					
99	198	C ₄ -alkyl benzene					
100	199	C ₁₁ H ₂₂ isomer					
101	200	n-undecane					
102	201	C ₁₁ H ₂₂ isomer					
103	202	C ₄ -alkyl benzene					
104	203	indole (cont.)					
105	204	C ₄ -alkyl benzene					
106	206	C ₅ -alkyl benzene					
107	207	C ₁₀ H ₁₂ isomer					
108	209	C ₁₂ H ₂₆ isomer					
109	211	C ₅ -alkyl benzene					
110	213	C ₁₂ H ₂₆ isomer					
111A	214	C ₅ -alkyl benzene					
111B	214	dimethylphenol isomer					
112	217	C ₁₂ H ₂₈ isomer					
113	218	n-dodecane					
114	219	naphthalene					
115	221	C ₆ -alkyl benzene					
116	222	C ₁₂ H ₂₈ isomer					
117	224	C ₁₂ H ₂₆ isomer					
118	226	C ₆ -alkyl benzene					
119	227	C ₁₂ H ₂₈ isomer					
120	230	chlorotoluene isomer					
121	231	C ₁₂ H ₂₈ isomer					
122	232	C ₁₂ H ₂₈ isomer					
123	233	C ₁₂ H ₂₈ isomer					
124	236	n-tridecane					
125	238	2-methylnaphthalene					
126	242	C ₁₄ H ₃₀ isomer					
127	isothermal	1-methylnaphthalene					
128		C ₁₄ H ₃₀ isomer					
129		C ₁₄ H ₃₀ isomer					

*Sampling was conducted on 7/1/76 from 1015 to 1038, see Table 15 for protocol (P3/L3).

Table A20. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND FROM KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	N ₂ + O ₂		26	110	trichloroethylene and n-pentanal	3,684 15,018
2	43	CO ₂		27	112	n-heptane	
3	49	chloromethane		28	114	C ₇ H ₁₄ isomer	
3A	50	propane		29	115	n-propyl acetate	
3B	51	1-butene		30	117	1-butanol (tent.)	
3C	52	n-butane		31	118	dioxane	
3D	53	2-butene		32	119-20	methylcyclohexane and 4-methyl-2-pentanone	
4	55	acetaldehyde	~3,125	32A	120	3-methyl-2-pentanone	
4A	60	C ₅ H ₁₀ isomer		33	121-2	C ₇ H ₁₄ isomer	
4B	61	isopentane		34	125	C ₈ H ₁₆ isomer	
4C	65	furan and C ₅ H ₁₀ isomer		34A	126	1,1,2-trichloroethane	4,467
5	66	n-pentane		35	217-8	toluene	
5A	66-7	propanal		35A	129	C ₈ H ₁₈ isomer	
5B	67	acrolein	4,000	36	131	C ₈ H ₁₈ isomer	
5C	68	dimethyl ether		36A	132	C ₈ H ₁₈ isomer	
6	69-71	acetone		37	133	dimethylcyclohexane isomer	
7	70	dichloromethane	100,000	38	134	n-hexanal	2,268
8	73	methyl-n-propyl ether		38A	135	C ₈ H ₁₆ isomer	
9	76	diethyl ether and isobutnal		39	137	n-octane and n-butyl acetate	
10	80	2-methylpentane		40	140	tetrachloroethylene	34,632
10A	82	2-methylpropanal		42	143	3-hexanone	
11	83	C ₈ H ₁₆ isomer		43	144	C ₉ H ₂₀ isomer	
12	85	n-butanol and hexafluoro- benzene (aB)		44	146	C ₉ H ₂₀ isomer	
12A	85	3-methylfuran		45	147	ethylcyclohexane	
13	86	n-hexane		45A	147	chlorobenzene	
13A	87	diisopropyl ether		46	149	C ₉ H ₁₈ isomer	
14	88	chloroform	8,334	47	151	ethylbenzene	
14A	89	methyl ethyl ketone	1,389	47A	152	C ₉ H ₁₈ isomer	
15	91	ethyl acetate and methyl vinyl ketone	9,467 7,091	47B	153	C ₉ H ₂₀ isomer	
16	93	perfluorotoluene (aB)		48	153	n-octene	
17	94	methylcyclopentane		49	154	C ₉ H ₂₀ isomer	
18	95	1,2-dichloroethane	9,543	50	156	2-heptanone	
19	97	1,1,1-trichloroethane	~150,000	51	157	cyclooctatetraene	
20	100-1	benzene	7,800	51A	158	heptanal	
20A	101	CEI ₄		52	159	n-octene and 1,1,2,2- tetrachloroethane	
21	102	isopropyl acetate	6,517	52A	159	C ₉ H ₁₈ isomer	
21A	103	cyclohexane		53	160	n-octane	
22	106	2-methylhexane		54	162	C ₉ H ₁₈ isomer	
23	105	2,3-dimethylpentane		54A	163	C ₁₀ H ₂₀ isomer	
24	108	3-methylhexane		54B	163	C ₉ H ₁₈ isomer and C ₁₀ H ₂₀ isomer	
25	109	1,3-dimethylcyclohexane					

(cont. Table 2)

Table A20 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
55	164	C ₁₀ H ₂₂ isomer		81	194	C ₄ -alkyl benzene isomer	
55A	165	isopropylbenzene		82	194	acetophenone	
56	166	C ₁₀ H ₂₂ isomer		82A	195	C ₁₁ H ₂₄ isomer	
57	167	C ₉ H ₁₆ isomer and C ₉ H ₁₈ isomer		83	196	C ₁₁ H ₂₄ isomer	
58	168	C ₁₀ H ₂₂ isomer		84	197	C ₁₁ H ₂₂ isomer	
58A	168	propylcyclohexane		84A	198	C ₄ -alkyl benzene isomer	
59	169	C ₁₀ H ₂₂ isomer		84B	198	C ₁₀ H ₁₆ isomer	
59A	169	α -pinene		84C	198	C ₁₁ H ₂₂ isomer	
60	170	C ₁₀ H ₂₀ isomer		85	199	η -nonanal	2,223
61	172	benzaldehyde	2,888	85A	200	C ₁₁ H ₂₂ isomer	
61A	172	η -propylbenzene and chlorotoluene isomer		86	201	η -undecane	
62	173	C ₁₀ H ₂₂ isomer		86A	201	C ₅ -alkyl benzene isomer and C ₁₁ H ₂₂ isomer	
63	173	η -ethyltoluene and C ₁₀ H ₂₂ isomer		87	202	C ₁₂ H ₂₆ isomer and C ₅ -alkyl benzene isomer	
64	175	C ₁₁ H ₂₄ isomer and 1,3,5-trimethylbenzene		88	203	C ₅ -cyclohexene isomer	
64A	175	C ₁₁ H ₂₄ isomer and 1,3,5-trimethylbenzene		89	205	C ₁₂ H ₂₆ isomer	
65	176	C ₁₀ H ₂₂ isomer		89A	206	C ₉ H ₁₄ O isomer	
65A	177	C ₁₀ H ₂₀ isomer		90	207	C ₄ -alkyl benzene isomer and C ₁₂ H ₂₆ isomer	
65B	177	C ₁₀ H ₂₂ isomer		90A	208	C ₁₀ H ₁₄ O isomer	
66	178	η -ethyltoluene		90B	208	C ₅ -alkyl benzene isomer	
67	179	C ₁₀ H ₁₈ isomer		91	209	C ₅ -alkyl benzene isomer	
67A	179	η -octanal	789	93	211	C ₅ -alkyl cyclohexane isomer	
67B	180	isobutylthiophene		94	212	C ₁₂ H ₂₆ isomer	
68	181	1,2,4-trimethylbenzene		95	213	tetramethylbenzene isomer	
69	183	η -decane		96	214	C ₁₁ H ₂₄ isomer + C ₅ - alkyl benzene isomer	
69A	182	C ₁₁ H ₂₄ isomer		97	215	C ₁₂ H ₂₈ isomer	
69B	182	C ₁₀ H ₂₀ isomer		98	216	trichlorobenzene isomer and undecanal	
70	183	dichlorobenzene (η or p) and η -butylthiophene		99	219	η -dodecane	
70A	183	C ₁₁ H ₂₄ isomer		200	220	naphthalene	
71	184	C ₁₁ H ₂₄ isomer		201	221	C ₁₃ H ₂₈ isomer	
71A	184	C ₆ -alkyl benzene isomer		203	226	C ₁₃ H ₂₈ isomer	
71B	185	1,2,4-trimethylbenzene		204	230	C ₁₃ H ₂₈ isomer	
72	186	C ₁₁ H ₂₄ isomer		205	231	C ₁₄ H ₃₀ isomer	
73	186	C ₁₀ H ₁₈ isomer		205A	231	C ₁₁ H ₂₀ O isomer	
74	187	η -dichlorobenzene		206	235	C ₆ -alkyl benzene isomer	
75	188	C ₁₀ H ₂₀ isomer		206A	236	C ₁₃ H ₂₈ isomer	
76	189	butylcyclohexane isomer		207	237	η -tridecane	
77	190	C ₁₁ H ₂₄ isomer		207A	238	C ₁₃ H ₂₈ isomer	
78	190	C ₁₀ H ₁₈ isomer		208	240	C ₁₃ H ₂₈ isomer	
79	191	C ₆ -alkyl benzene isomer		209	240	dimethylcyclohexane	
80	191	C ₁₀ H ₂₀ isomer		210	240	dimethylcyclohexane	
				211	240	C ₁₄ H ₃₀ isomer	

(cont'd)

Table A20 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
113A	240	biphenyl					
114	240	tetradecane					
115	240	n-butyl butyrate	1,517				
116	240	C ₁₅ H ₃₀ isomer					
117	240	C ₁₃ H ₂₆ O isomer					
118	240	C ₁₆ H ₃₄ isomer					
119	240	n-pentadecane					
121	240	n-hexadecane					

^a Sampling was conducted on 7/1/76 from 1006 to 1206, see Table 15 for protocol (P5/L4).

Table A21. VOLATILE ORGANICS IN AMBIENT AIR UPWIND OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	44	CO ₂		46	123	C ₈ H ₁₈ isomer	
3	52	propane		47	126	methyl isobutyl ketone	
4	54	1-butene		48	128	C ₈ H ₁₆ isomer	
5	56	acetaldehyde	~14,750	49	130	toluene	
6	60	isopentane		50	133	C ₈ H ₁₈ isomer	
8	63	C ₅ H ₁₀ isomer		51	136	C ₈ H ₁₆ isomer	
9	64	furan		52	138	n-hexanal	
10	66	n-pentane		53	140	n-octane	
11	67	isoprene		54	142	N,N-dimethylformamide	
12	68	propanal		55	143	tetrachloroethylene	694
12A	68	acrolein	trace	56	144	C ₈ H ₁₆ isomer	
13	70	C ₆ H ₁₄ isomer		57	146	C ₈ H ₁₈ isomer	
14	71	methylene chloride	3,000	58	148	C ₈ H ₁₈ isomer	
15	72	diethyl ether		59	150	chlorobenzene	
16	74	acetone		60	152	C ₉ H ₁₈ isomer	
17	76	isopropanol		61	154	ethylbenzene	
18	80	C ₆ H ₁₄ isomer		62	155	C ₉ H ₂₀ isomer	
19	82	2-butenal		63	156	p-xylene	
20	84	2-methylpentane		64	159	n-butylfuran	
21	85	C ₆ H ₁₄ isomer		65	161	styrene	
22	87	perfluorobenzene (aE)		66	162	o-xylene	
23	89	2-methylfuran		67	163	C ₉ H ₁₈ isomer	
23A	89	3-methylpentane		68	163	n-nonane	
24	90	n-hexane		69	164	C ₉ H ₁₈ isomer	
25	91	chloroform	944	70	167	cumene	
26	92	C ₆ H ₁₂ isomer		71	170	C ₉ H ₁₈ isomer	
27	94	methyl ethyl ketone	trace	72	172	C ₁₀ H ₂₂ isomer	
27A	94	methyl vinyl ketone	trace	73	174	o-pinene	
28	95	perfluorotoluene (aE)		74	175	n-propylbenzene	
29	96	methylcyclopentane		75	176	benzaldehyde	
30	98	ethyl acetate	trace	75A	176	C ₃ -alkyl benzene	
31	100	1,2-dichloroethane	trace	76	177	C ₃ -alkyl benzene	
32	101	1,1,1-trichloroethane	trace	77	178	C ₁₀ H ₂₂ isomer	
33	103	benzene	18,156	78	180	phenol	
34	104	carbon tetrachloride	3,125	79	181	benzonitrile	
35	105	cyclohexane		80	181	C ₃ -alkyl benzene	
36	106	C ₇ H ₁₆ isomer		81	182	C ₁₀ H ₂₀ isomer	
37	107	C ₇ H ₁₆ isomer		82	184	C ₃ -alkyl benzene	
38	108	C ₇ H ₁₆ isomer		82A	184	p-dioxane	
39	110	C ₇ H ₁₆ isomer		83	185	p-dichlorobenzene	
40	111	C ₇ H ₁₄ isomer		84	186	C ₅ -alkyl benzene	
41	113	tetrachloroethylene	trace	85	188	C ₁₁ H ₂₄ isomer	
42	114	n-heptane		86	190	1,2,3-trimethylbenzene	
43	116	C ₈ H ₁₆ isomer		87	190	p-dichlorobenzene	
44	119	C ₈ H ₁₆ isomer		88	194	C ₈ H ₁₆ isomer	
45	120	C ₈ H ₁₆ isomer		89	195	C ₈ -alkyl benzene	

(continued)

Table A21 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
89A	195	C ₁₁ H ₂₂ isomer					
90	196	C ₄ -alkyl benzene					
91	197	acetophenone					
92	198	C ₄ -alkyl benzene					
93	200	C ₄ -alkyl benzene					
94	202	C ₁₁ H ₂₄ isomer					
95	204	n-undecane					
96	206	C ₆ -alkyl benzene					
97	209	C ₄ -alkyl benzene					
98	212	dimethylphenol isomer					
99	213	C ₅ -alkyl benzene					
100	215	C ₄ -alkyl benzene					
101	217	C ₅ -alkyl benzene					
102	218	C ₅ -alkyl benzene					
103	220	C ₄ -alkyl benzene					
104	221	C ₆ -alkyl benzene					
105	222	C ₁₃ H ₂₈ isomer					
106	222	n-dodecane					
107	223	naphthalene					
108	225	C ₆ -alkyl benzene					
109	226	C ₅ -alkyl benzene					
110	228	C ₅ -alkyl benzene					
111	232	C ₅ -alkyl benzene					
112	236	C ₅ -alkyl benzene					
113	238	C ₆ -alkyl benzene					
114	239	n-tridecane					
115	240	2-methylnaphthalene					
116	isothermal	C ₁₄ H ₃₀ isomer					
117		1-methylnaphthalene					
118		C ₇ -alkyl benzene					
119		C ₁₄ H ₃₀ isomer					
120		C ₁₄ H ₃₀ isomer					
121		C ₁₅ H ₃₂ isomer					
122		C ₁₄ H ₂₈ isomer					
123		n-tetradecane					

^a Sampling was conducted on 7/1/76 from 1425 to 1625, see Table 15 for protocol (P6/L1).

Table A22. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND FROM AN INDUSTRIAL AREA^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	42	N ₂ + O ₂		23B	111	dimethylcyclopentane	
2	43	O ₂		24	112	n-pentanal and trichloroethylene	trace trace
3	51	propane		25	114	n-heptane	
4	53	i-butene		25A	116	2-pentanone	
4A	54	n-butane		25B	118	C ₈ H ₁₈ isomer	
4B	55	i-butene		26	121	methylcyclohexane	
5	56	acetaldehyde	-25,000	27	123	C ₈ H ₁₈ isomer	
5A	63	isopentane		28	125	4-methyl-2-pentanone	
6A	66	C ₅ H ₁₀ isomer		29	127	C ₈ H ₁₆ isomer	
6B	66	pentadiene isomer		30	129	toluene	
6C	67	C ₅ H ₁₀ isomer and furan		30A	130	C ₈ H ₁₈ isomer	
7	68	n-pentane		31	132	C ₈ H ₁₈ isomer	
8	69	propanal and acrolein	trace	31A	134	C ₈ H ₁₄ isomer	
8D	70	C ₅ H ₁₀ isomer		31B	135	C ₈ H ₁₆ isomer	
8E	71	dichloromethane	trace	31C	135	C ₈ H ₁₄ isomer	
8F	71	dimethyl ether (tent.)		32	136	n-hexanol	1,200
9	72-3	acetone		32C	137	C ₈ H ₁₆ isomer	
9A	74	methyl propyl ether		33	138	n-octane	
10	79	2-methylpentane		34	141	tetrachloroethylene	1,229
11	83	2-methylpropane		34A	143	C ₈ H ₁₂ isomer	
11A	84	C ₆ H ₁₂ isomer and 3-methylpentane		35	144	heptanone	
11B	85	vinyl acetate	trace	35A	146	C ₉ H ₂₀ isomer	
11C	85	C ₆ H ₁₂ isomer		35B	148	ethylcyclohexane	
12	86	hexafluorobenzene (eB)		35C	149	chlorobenzene	
13	87	butanal and n-hexane		35D	151	C ₉ H ₁₈ isomer	
13A	88	3-methylfuran		35E	152	C ₉ H ₁₄ isomer	
14	90	chloroform	2,500	36	153	ethylbenzene	
14A	90-2	methyl vinyl ketone	trace	36A	153	C ₉ H ₂₀ isomer	
15	93-4	methyl ethyl ketone	555	37	154	p-xylene	
16	95	perfluorotoluene (eB)		38	155	C ₉ H ₂₀ isomer	
17	96	methylcyclopentane and C ₇ H ₁₆ isomer		38A	156	C ₉ H ₁₆ isomer	
18	98	1,1,1-trichloroethane	417	38B	157	C ₇ H ₁₄ O isomer	
18A	99	C ₇ H ₁₆ isomer		39	158	2-heptanone and 3-n-butylfuran (tent.)	
19	101	benzene and carbon tetra- chloride and thiophene	6,875	39A	158	cyclooctatetraene or styrene	
19A	102	cyclohexane		40	159	n-heptanol	
20	106	2-methylhexane		41	160	m-xylene	
21	107	2,3-dimethylpentane		41A	160	C ₉ H ₁₈ isomer	
22	108	3-methylhexane		42	161	n-nonane	
22A	108	C ₇ H ₁₆ isomer		42A	163	C ₁₀ H ₂₂ isomer	
22B	108	methyl isopropyl ketone		43	166	isopropylbenzene and C ₉ H ₁₈ isomer	
23	108	dimethylcyclopentane isomer and 3-ethylpentane		44	168	C ₉ H ₁₈ isomer	
23A	108	butanol (tent.)		45	170	C ₁₀ H ₂₂ isomer	
23B	108	butanol (tent.)		45A	172	octanone isomer	

(continued)

Table A22 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
46	173	chlorotoluene isomer and benzaldehyde	3,400	68	220	n-dodecane	
47	174	p-ethyltoluene		69	221	naphthalene	
47A	175	C ₁₀ H ₂₂ isomer		70	223	C ₁₂ H ₂₄ isomer	
48	176	C ₁₁ H ₂₄ isomer		70A	234	2-undecanone	
49	178	phenol and cyanobenzene and octanone isomer		71	236	C ₁₃ H ₂₆ isomer	
49A	178	o-ethyltoluene		72	238	n-tridecane	
50	179	unknown		73	240	β-methylnaphthalene	
51	180	n-octanal	1,250	73A	240	α-methylnaphthalene	
51A	181	C ₁₀ H ₂₀ isomer		75	240	dodecanone	
52	182	1,2,4-trimethylbenzene and C ₉ H ₂₀ isomer	8,033	77	240	n-tetradecane	
53	184	benzylchloride		77A	240	n-butylbutyrate	trace
53A	185	dichlorobenzene (m or p)		78	240	2-tridecanone	
53B	187	C ₁₁ H ₂₄ isomer		79	240	C ₁₅ H ₃₀ isomer	
54	188	1,2,3-trimethylbenzene and C ₉ H ₂₀ isomer		80	240	n-pentadecane	
54A	189	C ₁₂ H ₂₆ isomer		81	240	n-hexadecane	
54B	190	o-dichlorobenzene and C ₁₀ H ₂₀ isomer					
55	192	bromotoluene isomer	472				
56	193	C ₄ -alkyl benzene isomer					
57	195	acetophenone					
58	197	2-nonanone					
58A	198	C ₄ -alkyl benzene isomer					
58B	199	C ₁₁ H ₂₂ isomer					
59	201	n-nonanal	3,080				
60	202	n-undecane					
60A	203	C ₁₂ H ₂₄ isomer					
60B	204	C ₁₂ H ₂₆ isomer					
61	206	methylcyanobenzene					
62	208	dichlorotoluene isomer					
62A	211	1,2,3,6-tetrahydronaphthalene isomer and methylphenol isomer					
62B	212	dimethylphenol (tent.)					
64	213	C ₄ -alkyl benzene and decanone isomer					
64A	214	C ₁₃ H ₂₆ isomer					
64B	215	C ₄ -alkyl benzene isomer					
65	217	C ₁₃ H ₂₈ isomer and dimethyl- phenol isomer					
66	218	2-decanone					
66A	219	C ₄ -alkyl benzene isomer					
67	219	decenal (tent.)					

^a Sampling was conducted on 7/1/76 from 1425 to 1675, see Table 15 for protocol (P6/L2).

Table 23. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR ON TOP OF
KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	66	dimethyl ether		29	120	methyl isobutyl ketone	444,500
2	67	acetone		30	123	sec-butyl acetate (tent.)	
3	68	diethyl ether		31	126	isobutyl acetate	
4	70-1	dichloromethane	460,000	32	129	toluene	
6	72-4	methyl propyl ether		32A	130	C ₈ H ₁₈ isomer	
6A	77	C ₆ H ₁₂ isomer		33	131	C ₈ H ₁₈ isomer	
6B	80	C ₆ H ₁₂ isomer		34	133	2-hexanone and dimethyl- cyclohexane isomer	
7	81	1,1-dichloroethane and 2-methylpentane	22,700	34A	134	C ₈ H ₁₆ isomer	
7A	81	ethyl isopropyl ether (tent.)		35	136	pentanol and C ₈ H ₁₈ isomer	
7B	82	2-methylpropanal		35A	135	n-hexanal	trace
8	83	vinyl acetate		35B	136	C ₈ H ₁₆ isomer	
9	84	propanol (tent.) and 3-methylpentane		36	137	n-octane and n-butyl acetate	22,500
9A	85	methyl vinyl ketone and butanal	trace	37	138	C ₈ H ₁₆ isomer	
10	86	methyl ethyl ketone	33,300	38	140	tetrachloroethylene	394,000
10A	87	hexafluorobenzene (e#)		39	142	C ₉ H ₂₀ isomer	
11	87	n-hexane		40	143	C ₉ H ₂₀ isomer	
11A	88	chloroform	27,200	41	145	C ₉ H ₂₀ isomer	
12	89-91	ethyl acetate	232,000	42	146	ethylcyclohexane	
13	93	perfluorotoluene (e#)		43	147	chlorobenzene	7,500
14	95	methylcyclopentane		44	149	1,3,5-trimethylcyclohexane	
15	96	1,2-dichloroethane	27,700	44A	150	C ₉ H ₂₀ isomer	
16	98	1,1,1-trichloroethane	121,000	45	151	ethylbenzene	
17	100	tetrahydrofuran (tent.)		45A	152	C ₉ H ₁₈ isomer	
18	101-2	benzene	191,000	46	152-3	p-xylene and C ₉ H ₂₀ isomer	
18A	102	carbon tetrachloride	10,600	47	154	C ₉ H ₂₀ isomer	
18B	103	isopropyl acetate		47A	155	C ₉ H ₂₀ isomer	
19	104	cyclohexane		47B	155	C ₉ H ₁₈ isomer	
19A	104	2-methylhexane		48	156	C ₉ H ₂₀ isomer	
20	105	2,3-dimethylpentane		49	158	styrene or cyclooctatetraene and C ₉ H ₂₀ isomer	
21	107	3-methylhexane		50	159	p-xylene and 1,1,3,3- tetrachloroethane	15,000
21A	108	butanol (tent.)		50A	160	1-methyl-2-ethylcyclohexane	
22	109	dimethylcyclopentane		51	161	n-nonane	
23	110	n-pentanal	28,800	52	162	C ₁₀ H ₂₂ isomer	
23A	111	trichloroethylene	trace	52A	163	C ₁₀ H ₁₈ isomer	
23B	112	C ₇ H ₁₆ isomer		53	165	C ₁₀ H ₁₈ isomer (tent.)	
24	113	n-heptane		53A	164	C ₁₀ H ₂₂ isomer	
25	114	C ₇ H ₁₆ isomer		53B	164	C ₁₀ H ₁₈ isomer	
26	115	n-propyl acetate		54	165	C ₁₀ H ₂₂ isomer	
26A	116	2-butanol		55	166	isopropylbenzene and C ₁₀ H ₂₂ isomer	
27	117	2-methyl-2-pentanone (tent.)		55A	167	n-propylcyclohexane	
27A	117	dimane					

(continued)

Table A23 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
56	168	C ₁₀ H ₂₂ isomer		80A	198	indan	
57	169	C ₁₀ H ₂₂ isomer		81	199	C ₁₁ H ₂₂ isomer	
58	170	o-pyrene and C ₁₀ H ₂₂ isomer		82	201	n-undecane	
59	171	diethylcyclohexane		83	202	C ₃ -alkyl benzene	
60	172	n-propylbenzene and C ₁₀ H ₁₈ isomer		84	203	C ₁₁ H ₂₂ isomer	
60A	173	benzaldehyde and C ₁₀ H ₂₂ isomer	5,525	85	204	C ₁₂ H ₂₆ isomer	
61	174	m-ethyltoluene and C ₁₀ H ₂₂ isomer		86	205	C ₄ -alkyl benzene	
62	175	C ₁₁ H ₂₄ isomer		87	207	C ₄ -alkyl benzene and C ₁₂ H ₂₆ isomer	
62A	176	C ₁₀ H ₂₂ isomer		88	209	C ₅ -alkyl benzene and C ₁₁ H ₂₀ isomer	
62B	176	C ₁₀ H ₂₀ isomer		89	210		
63	177	C ₁₀ H ₂₂ isomer and m- ethyltoluene		89A	210	C ₁₀ H ₁₂ isomer	
64	178	C ₁₁ H ₂₄ isomer		90	211	C ₁₂ H ₂₆ isomer	
65	180	C ₁₀ H ₂₂ isomer and C ₁₀ H ₁₆ isomer		91	212	C ₁₁ H ₂₀ isomer	
66	181	1,2,4-trimethylbenzene and n-decane		91A	213	C ₁₂ H ₂₆ isomer and C ₄ -alkyl benzene	
67	183	C ₁₀ H ₂₀ isomer		92	213	C ₃ -alkyl benzene	
68	184	dichlorobenzene (m or p)		93	214	C ₁₂ H ₂₆ isomer	
69	185	C ₁₁ H ₂₄ isomer		94	215	C ₁₁ H ₂₆ isomer and decal (tent.)	
70	186	C ₄ -alkyl benzene and C ₁₁ H ₂₄ isomer		95	217	bromobenzene isomer (tent.)	50,500
71	187	1,2,3-trimethylbenzene and C ₄ -alkyl benzene		96	218	n-dodecane	
72	188	C ₁₁ H ₂₄ isomer		97	219	naphthalene	
72A	188	C ₁₁ H ₂₂ isomer		98	221	C ₁₃ H ₂₈ isomer	
73	189	limonene (or C ₁₀ H ₁₆) and p-dichlorobenzene					
74	190	n-butylcyclohexane					
74A	190	C ₁₂ H ₂₆ isomer					
75	191	C ₁₁ H ₂₂ isomer and C ₄ -alkyl benzene					
75A	192	C ₁₂ H ₂₄ isomer and C ₄ -alkyl benzene					
76	193	C ₁₁ H ₂₂ isomer and styrene					
77	194	C ₁₁ H ₂₄ isomer					
78	194	C ₁₁ H ₂₂ isomer					
79	195	C ₁₁ H ₂₂ isomer					
79A	197	C ₄ -alkyl benzene					
80	198	C ₁₂ H ₂₆ isomer and C ₁₀ H ₁₈ isomer					

^a Sampling was conducted on 7/1/76 from 1444 to 1458, see Table 15 for protocol (P6/2.3).

Table A24. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR DOWNWIND OF KIN-BUC DISPOSAL SITE^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
1	41	N ₂ + O ₂		30	109	dimethylcyclopentane isomer	
2	43	CO ₂				+ C ₁₈ H ₁₆ isomer	
4	50	propane		31	110	n-pentanal and tri- chloroethylene	10,606
5	52	1-butene		31A	111	C ₇ H ₁₄ isomer	
3A	53	n-butane		32	112	n-heptane	
6	54	acetaldehyde	~625	33	114	C ₇ H ₁₄ isomer	
8	60	C ₅ H ₁₀ isomer		34	115	n-propyl acetate	3,225
8A	61	isopentane		34A	116	1-butanol (tent.)	
9	63	furan		34B	117	2-methyl-3-pentanone	
9A		C ₅ H ₁₀ isomer		35	118	C ₈ H ₁₈ isomer and dioxan	
9B	64	n-pentane		35A	119	methylcyclohexane	
10	66	propanal and acrolein		36	120-2	4-methyl-2-pentanone	24,000
10A	67	dimethyl ether		37	123	3-methyl-2-pentanone (tent.)	750
11	69-71	acetone		37A	124	C ₈ H ₁₆ isomer	
12	69	dichloromethane	42,000	38	125	C ₈ H ₁₈ isomer	
13	72-73	methyl propyl ether		38A	126	C ₈ H ₁₆ isomer	
14	77	C ₆ H ₁₂ isomer		39	128-130	toluene	
15	79	2-methylpentane		39A	129	C ₈ H ₁₈ isomer	
15A	81	2-methylpropanal		40	131	C ₈ H ₁₈ isomer	
16	82	vinyl acetate	14,523	41	133	dimethylcyclohexane	
16A	83	3-methylpentane		42	134	pentanol isomer (tent.)	2,900
16B	84	C ₆ H ₁₂ isomer		43	137	n-octane	
17	85	n-butanol and hexa- fluorobenzene (nB)		43A	137-8	n-butyl acetate	
17A	86	3-methylfuran		43B	139	C ₈ H ₁₆ isomer	
18	87	n-hexane		44	139-40	tetrachloroethylene	12,500
18A	87	diisopropyl ether		45	143	C ₉ H ₂₀ isomer	
19	88	chloroform	28,334	46	144	hexanone	
19A	89-91	methyl ethyl ketone		47	146	C ₉ H ₂₀ isomer	
20	92	ethyl acetate and methyl vinyl ketone	4,046 400	48	147	ethylcyclohexane	
21	93	perfluorotoluene (nB)		49	149	chlorobenzene	
22	94	methylcyclopentane		49A	150	C ₉ H ₁₈ isomer	
22A	95	C ₇ H ₁₆ isomer		50	151	ethylbenzene	
23	96	1,3-dichloroethane	240	50A	151	C ₉ H ₁₈ isomer	
24	97-8	1,1,1-trichloroethane	73,000	51A	152	C ₉ H ₂₀ isomer	
24A	99	C ₇ H ₁₆ isomer		51	153	n-octane	
25	101	benzene	27,343	51	154	C ₉ H ₂₀ isomer	
25A	100	carbon tetrachloride		53	156	heptanone and n-octane	
25B	100	C ₇ H ₁₆ isomer		53A	157	C ₉ H ₁₆ isomer	
26	103	isopropyl acetate	351	54	157	styrene or cyclopenta- diene and heptanal	
26A	103	cyclohexane		55	158	n-octane and 1,1,2,2- tetrachloroethane	1,289
27	104	2-methylhexane		55A	159	C ₉ H ₁₈ isomer	
28	108	2,3-dimethylpentane		55B	159	1-methyl-2-ethylcyclohexane	
29	106	3-methylhexane		56	160	n-octane	

(continued)

Table A24 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/m ³
57	161	C ₁₀ H ₂₂ isomer		84	193	C ₆ -alkyl benzene and C ₁₁ H ₂₂ isomer	
59	164	C ₉ H ₁₈ isomer and C ₁₀ H ₂₀ isomer		85	194	C ₄ -alkyl benzene and C ₁₁ H ₂₄ isomer	
59A	165	C ₁₀ H ₂₂ isomer		86	194	acetophenone	
60	165	isopropylbenzene		87	195	C ₁₁ H ₂₄ isomer	
60A	166	C ₁₀ H ₂₂ isomer		87A	196	C ₁₁ H ₂₂ isomer	
60B	167	C ₃ -alkyl cyclohexane isomer		87B	197	C ₆ -alkyl benzene and nonanone isomer	
60C	167	C ₉ H ₁₆ isomer		88	198	C ₁₁ H ₂₂ isomer and C ₁₁ H ₂₀ isomer	
61	168	C ₁₀ H ₂₂ isomer		88A	198	C ₁₁ H ₂₂ isomer	
62	169	n-propylcyclohexane		89	199	nonanal	
63	170	C ₁₀ H ₂₂ isomer		89A	200	C ₁₁ H ₂₂ isomer	
63A	170	α-pinene		90	201	n-undecane	
63B	171	C ₁₀ H ₂₀ isomer and C ₁₀ H ₁₈ isomer		91	202	C ₁₁ H ₂₂ isomer	
64A	171	benzaldehyde		91A	202	C ₁₁ H ₂₄ isomer	
64B	172	n-propylbenzene		91B	203	C ₃ -alkyl cyclohexane isomer	
65	173	C ₁₀ H ₂₂ isomer		92	203	C ₁₂ H ₂₄ isomer and C ₃ - alkyl benzene isomer	
66	173	n-ethyltoluene		93	204	C ₁₁ H ₂₄ isomer	
66A	174	C ₁₀ H ₁₈ isomer		94	205	tetramethylbenzene isomer	
67	174	C ₁₀ H ₂₂ isomer		94A	206	C ₁₁ H ₂₀ isomer	
68	175	C ₁₁ H ₂₄ + 1,3,5-trimethyl- benzene		95	206	C ₁₁ H ₂₆ isomer	
69	176	phenol and C ₁₀ H ₂₀ isomer		96	207	C ₄ -alkyl benzene isomer	
70	177	C ₁₀ H ₂₂ isomer		96A	208	C ₁₂ H ₂₂ isomer (test.)	
71	178	n-ethyltoluene and C ₁₀ H ₂₂ isomer		98A	210	C ₃ -alkyl cyclohexane isomer	
71A	179	n-octanal		99	211	C ₁₂ H ₂₆ isomer	
72A	180	C ₁₀ H ₁₈ and isobutyl- thiophene		99A	211	C ₁₂ H ₂₄ isomer	
72	181	1,2,4-trimethylbenzene		100	212	C ₁₂ H ₂₆ isomer	
73	181	n-decane		101	213	C ₅ -alkyl benzene isomer	
74	183	C ₁₀ H ₂₂ isomer		102	214	C ₁₂ H ₂₄ isomer	
75	184	dichlorobenzene (m or p) and n-butylthiophene		103	215	C ₁₂ H ₂₄ isomer	
76	185	C ₁₁ H ₂₄ isomer		104	216	decane and trichloro- benzene	
77	186	C ₁₁ H ₂₆ isomer		105	219	n-undecane	
78	186	C ₆ -alkyl benzene and 1,2,3-trimethylbenzene		106	220	naphthalene	
79	187	C ₁₁ H ₂₄ isomer		106A	221	C ₁₂ H ₂₄ isomer	
79A	188	C ₁₂ H ₂₆ isomer		107	222	C ₁₃ H ₂₈ isomer	
80	189	n-dichlorobenzene	3,000	108	223	C ₁₃ H ₂₆ isomer	
80A	189	C ₁₁ H ₂₄ isomer		109	227	C ₁₃ H ₂₈ isomer	
81	190	isopropylcyclohexane		109A	228	C ₁₃ H ₂₆ isomer	
82	190	C ₁₁ H ₂₂ isomer		110	229	C ₁₃ H ₂₈ isomer and C ₆ - alkyl benzene isomer	
83	191	C ₁₂ H ₂₆ isomer		110A	230	C ₁₃ H ₂₈ isomer	
				111	231	C ₁₃ H ₃₀ isomer (test.)	

(continued)

Table A24 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/g ^a	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	ng/g ^a
112	234	C ₁₃ H ₂₆ isomer and C ₁₃ H ₂₆ isomer					
113	235	C ₁₃ H ₂₆ isomer					
114	236	n-tridecane					
114A	237	C ₁₃ H ₂₆ isomer					
115	isothermal	C ₁₄ H ₃₀ isomer					
116		C ₁₄ H ₂₈ isomer					
117		C ₇ -alkyl benzene isomer and C ₁₄ H ₃₀ isomer					
119		C ₁₃ H ₂₆ O isomer (tent.)					
120		C ₁₄ H ₂₈ isomer					
121		n-tetradecane					
122		n-butyl butyrate					
123		pentadecane					
124		C ₁₅ H ₃₂ isomer					
125		n-hexadecane					

^aSampling was conducted on 7/1/76 from 1425 to 1625, see Table 15 for protocol (P6/L4).

Table A25. VOLATILE ORGANICS VAPORS IN AMBIENT AIR IDENTIFIED IN MILBY PARK^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	29	86	toluene
2	41	dichlorodifluoromethane	30	88	C ₈ H ₁₈ isomer
2A	43	1-butene	31	89	dichlorobutene isomer
3	44	C ₄ H ₆ isomer	31A	90	C ₈ H ₁₈ isomer
4	45	acetaldehyde	31B	91	dimethylcyclohexane isomer
5	48	trichlorofluoromethane	31C	91	2-hexanone
6	48	dimethyl ether + propanal + propanal	32	92	n-hexanal
7	49	acetone + C ₅ H ₁₂ isomer	33	95	n-octane
7A	51	dichloromethane	33A	95	tetrachloroethylene
8A	54	ter-butanol + isopropanol	33B	96	C ₈ H ₁₆ + C ₈ H ₁₄ isomers
8B	55	isobutanol	34	96	acetic acid (tent.)
9	56	2-methylpentane	35	97	C ₈ H ₁₄ isomer
9A	56	crotonaldehyde	35A	98	C ₈ H ₁₆ isomer
9B	57	3-methylpentane	35B	99	C ₈ H ₁₄ isomer
10	58	chloroprene	36	100	furfural
10A	58	n-butanal	37	101	4-vinylcyclohexene
11	59	hexafluorobenzene (eV)	38	104	C ₈ H ₁₄ isomer
12	60	n-hexane	39	105	ethylbenzene
13	61	chloroform	40	107	m-xylene
14	64	perfluorotoluene (eV) + methyl- cyclopentane	41	108	C ₉ H ₂₀ isomer
14A	64	1,2-dichloroethane	42	109	C ₉ H ₂₀ isomer
15	65	1,1,1-trichloroethane + dimethylpentane isomer	43	111	cyclooctatetraene
15A	66	C ₇ H ₁₄ isomer	44	112	p-xylene
15B	67	3-methylbutanal	45	113	C ₉ H ₁₈ isomer
16	68	benzene	45A	113	n-heptanal
16A	69	carbon tetrachloride + C ₇ H ₁₆ isomer	45B	114	dichlorobutene isomer
17	69	cyclohexane	46	115	n-nonane
18	70	2-methylhexane	46A	117	C ₉ H ₁₈ isomer
19	71	2,3-dimethylpentane	47	118	isopropylbenzene
20	72	3-methylhexane	48	118	C ₁₀ H ₂₂ isomer
20A	73	n-pentanal + C ₇ H ₁₄ isomer	48A	120	C ₁₀ H ₂₀ isomer
20B	74	C ₇ H ₁₆ isomer	49	122	C ₁₀ H ₂₂ + C ₁₀ H ₂₀ isomers
21	74	dimethylcyclopentane + trichloroethylene	50	123	benzaldehyde
22	76	n-heptane	50A	124	n-propylbenzene
23	77	2,2,4-trimethyl-1-pentene	51	125	m-ethyltoluene
23A	79	C ₇ H ₁₄ isomer	51A	126	C ₁₀ H ₂₂ isomer
24	80	methylcyclohexane	51B	127	1,3,5-trimethylbenzene + C ₁₀ H ₂₂ isomer
25	81	4-methyl-2-pentanone	52	128	C ₁₁ H ₂₄ isomer
26	82	C ₈ H ₁₈ + C ₈ H ₁₄ isomers	53	129	C ₁₀ H ₂₂ isomer
27	83	C ₈ H ₁₆ isomer	53A	130	C ₉ H ₁₈ isomer
			54	131	C ₁₁ H ₂₄ isomer
			54A	132	C ₁₀ H ₂₀ isomer
			55	132	n-octanal + C ₁₀ H ₂₀ isomer
			55A	133	p-ethyltoluene

(continued)

Table A25 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
55B	134	C ₁₀ H ₂₀ isomer	72B	172	C ₁₀ H ₂₀ O isomer
56	135	dichlorobenzene + C ₁₁ H ₂₄ isomers	72C	174	C ₃ -alkyl phenol isomer
57	135	n-decane	72D	175	unknown
58	136	C ₁₂ H ₂₄ isomer	73	177	C ₃ -alkyl phenol isomer
58A	136	C ₁₀ H ₂₀ isomer	73A	179	C ₆ -alkyl benzene isomer
59	137	triisobutylene	73B	181	C ₁₁ H ₂₂ O isomer (tent.)
59A	135	1,2,3-trimethylbenzene	74	182	C ₁₃ H ₂₈ isomer
59B	138	C ₄ -alkyl benzene isomer	74A	183	undecanone
59C	139	C ₁₁ H ₂₄ isomer	74B	185	C ₁₃ H ₂₆ isomer + 8-methyl- naphthalene
60	140	C ₁₂ H ₂₆ isomer + indan	75	186	n-tridecane
60A	141	indene	76	189	saturated alcohol (tent.)
61	142	C ₁₁ H ₂₂ isomer	76A	191	tetraisobutylene
61A	143	C ₄ -alkyl benzene isomer	76B	193	C ₁₄ H ₃₀ isomer
62	143	C ₁₂ H ₂₆ isomer	76C	194	isobutyl isobutyrate
62A	144	C ₄ -alkyl benzene isomer	76D	195	C ₁₄ H ₃₀ isomer
63	144	acetophenone	77	196	isobutyl n-butyrate
63A	145	C ₁₁ H ₂₂ isomer	77A	198	dodecanone + C ₁₄ H ₂₈ isomers
63B	145	unknown	78	200	C ₁₂ H ₁₀ O isomer (tent.)
64	147	C ₁₂ H ₂₆ isomer	79	201	n-tetradecane
64A	147	C ₁₁ H ₂₂ isomer	79A	204	C ₁₄ H ₂₈ isomer
64B	148	C ₄ -alkyl benzene isomer	80	206	dimethyl phthalate
65	148	C ₁₁ H ₂₂ isomer	81A	208	C ₁₇ H ₃₆ isomer (tent.)
65A	149	methylindan (tent.)	82	212	C ₁₅ H ₃₂ isomer
65B	149	C ₄ -alkyl benzene isomer	82A	214	tridecanone
66	151	n-nonanal	83	215	C ₁₅ H ₃₀ isomer
66A	152	C ₁₁ H ₂₂ isomer	84	216	n-pentadecane
66B	153	C ₅ -alkyl benzene isomer	85	227	C ₉ H ₁₈ O ₂ isomer (tent.)
67	154	n-undecane	86	228	n-hexadecane
67A	155	C ₁₁ H ₂₂ isomer	87	237	tetrachlorohexafluorobutane isomer (tent.)
68	156	C ₄ -alkyl benzene isomer	88	238	C ₁₅ H ₃₀ O isomer
69	159	dimethylphenol isomer	88A	240	C ₁₇ H ₃₄ isomer
69A	161	C ₄ -alkyl benzene isomer	89	240	silane compound (BEC)
69B	162	C ₅ -alkyl benzene isomer	90	240	unknown
70	163	dimethylphenol isomer	91	240	C ₁₆ H ₃₂ O isomer
70A	164	C ₁₂ H ₂₆ isomer	92	240	C ₁₇ H ₃₄ isomer
70B	165	C ₁₂ H ₂₄ isomer	93	240	C ₁₈ H ₃₈ isomer
70C	166	naphthalene	94	240	silane compound (BEC)
70D	167	C ₃ -alkyl phenol + C ₁₁ H ₂₂ isomers	95	240	unknown
70E	168	C ₅ -alkyl benzene + C ₁₂ H ₂₄ isomers			
71	168	n-decanal			
71A	169	C ₁₂ H ₂₄ isomer			
72	170	n-dodecane			
72A	171	decanone			

^a Sampling was at HL1 (Fig. 12) as described in Table 16.

Table A26. VOLATILE ORGANICS IDENTIFIED IN AMBIENT AIR
IN HOUSTON, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	30	88	n-hexanal
1A	40	ethanol	30A	88	C ₈ H ₁₆ isomer
2	43	C ₄ H ₆ isomer	31	90	n-octane
3	43	acetaldehyde	31A	91	tetrachloroethylene
4	45	isopentane	32	92	C ₈ H ₁₄ isomer
5	46	acetone	33	93	C ₈ H ₁₄ isomer
5A	47	dimethyl ether + diethyl ether	34	94	C ₈ H ₁₆ isomer
6B	49	ter-butanol + isopropanol (tent.)	35	97	C ₈ H ₁₂ isomer
7	50	n-butanol	36	99	C ₉ H ₁₂ isomer
8	51	2-methylpentane + 2-methyl- propenal	36A	100	C ₉ H ₁₈ isomer
8A	53	3-methylpentane	36B	101	C ₈ H ₁₄ isomer
9	53	2-chloro-1,3-butadiene	37	102	ethylbenzene
10	54	hexafluorobenzene (eW)	37A	102	C ₉ H ₁₈ isomer
11	55	n-hexane	38	104	m-xylene
13	57	perfluorotoluene (eW)	39	105	C ₉ H ₂₀ isomer
13A	58	methylcyclopentane	40	107	C ₉ H ₂₀ isomer
14A	61	3-methylbutanal	41	108	cyclooctatetraene
14B	61	C ₆ H ₁₀ isomer	42	109	o-xylene
15	62	benzene	43	110	n-heptaldehyde
15A	62	carbon tetrachloride	44	111	C ₉ H ₁₈ isomer
15B	63	cyclohexane	44A	112	C ₉ H ₁₆ isomer
16	64	2-methylhexane	45	113	n-nonane
17	64	2,3-dimethylpentane	45A	114	C ₈ H ₁₈ isomer
17A	66	C ₇ H ₁₄ isomer	46	116	isopropylbenzene
18	67	n-pentanal	47	117	C ₁₀ H ₂₂ isomer
18A	67	C ₇ H ₁₂ isomer	48	118	C ₁₀ H ₂₂ isomer
18B	68	C ₇ H ₁₄ isomer	48A	119	C ₉ H ₁₈ isomer
18C	68	C ₇ H ₁₂ isomer	49	120	C ₁₀ H ₂₂ isomer
19	70	n-heptane	50	121	benzaldehyde
19A	70	C ₇ H ₁₀ isomer	51	122	n-propylbenzene
20	72	diisobutylene	52	124	m-ethyltoluene
21	74	methylcyclohexane	52A	125	C ₁₀ H ₂₂ isomer
22	75	C ₈ H ₁₆ isomer	53	125	1,3,5-trimethylbenzene
23	76	4-methyl-2-pentanone + C ₈ H ₁₈ isomer	53A	126	C ₁₀ H ₂₀ isomer
24	78	acetic acid (tent.)	54	126	C ₁₁ H ₂₄ isomer
25	80	C ₈ H ₁₄ isomer	55	127	C ₉ H ₁₈ isomer
26	81	toluene	55A	128	C ₁₀ H ₂₂ isomer
26A	82	C ₈ H ₁₆ isomer	56	129	C ₁₀ H ₂₀ isomer + phenol
26B	83	C ₈ H ₁₆ isomer	56A	130	C ₁₀ H ₂₂ isomer
27	83	C ₈ H ₁₈ isomer	57	131	o-ethyltoluene
28	84	dichlorobutane isomer	57A	131	C ₁₀ H ₂₀ isomer
28A	85	C ₈ H ₁₈ isomer	58	133	n-decane
29	86	C ₈ H ₁₆ isomer	59	134	C ₁₂ H ₂₄ isomer
			60	136	triisobutylene
			60A	136	1,2,3-trimethylbenzene
			61	138	C ₁₀ H ₂₀ isomer

(continued)

Table A26 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
62	139	indan	88	185	8-methylnaphthalene
63	139	C ₁₁ H ₂₄ isomer	88A	186	C ₁₃ H ₂₆ isomer
64	140	indene	89	187	n-tridecane
64A	141	C ₁₁ H ₂₂ isomer	90	188	o-methylnaphthalene
64B	141	C ₄ -alkyl benzene isomer	91	190	dimethylbutanol isomer (tent.)
65	142	C ₄ -alkyl benzene isomer	92	192	C ₁₄ H ₃₀ isomer
66	143	acetophenone	93	194	C ₁₄ H ₂₈ isomer
66A	143	C ₄ -alkyl benzene isomer	94	195	n-butyl butyrate
67	144	C ₁₁ H ₂₄ + C ₄ -alkyl benzene isomers	95	197	isobutyl butyrate
67A	145	C ₁₀ H ₁₈ isomer	96	199	methylheptanol (tent.) isomer
68	146	cresol isomer	97	201	C ₁₄ H ₂₈ isomer
68A	147	C ₁₁ H ₂₂ isomer	98	202	n-tetradecane
69	147	C ₄ -alkyl benzene isomer	99	203	C ₁₄ H ₂₈ isomer
70	149	C ₄ -alkyl benzene isomer	99A	206	C ₁₅ H ₃₀ isomer
70A	149	C ₁₁ H ₂₂ isomer	100	207	C ₁₅ H ₃₀ isomer
71	150	n-nonanal	100A	209	C ₁₅ H ₃₀ isomer
71A	151	C ₁₁ H ₂₂ isomer	100B	210	C ₁₆ H ₃₄ isomer
71B	152	C ₅ -alkyl benzene isomer	101	212	C ₁₅ H ₃₂ isomer
71C	152	C ₄ -alkyl benzene isomer	102	215	C ₁₅ H ₃₀ isomer
72	153	n-undecane	103	217	n-pentadecane
73	155	C ₄ -alkyl benzene isomer	104	218	alkyl alcohol (tent.)
73A	156	dimethylphenol + C ₁₂ H ₂₆ isomers	105	219	alkyl alcohol isomer (tent.)
73B	157	C ₁₂ H ₂₄ isomer	107	225	diethyl phthalate
74	158	2,3-dimethylphenol	109	230	C ₁₆ H ₃₂ isomer
75	160	methylindan isomer (tent.)	110	234	tributyl phosphate
75A	161	C ₄ -alkyl benzene isomer	112	240	C ₁₆ H ₃₂ isomer (tent.)
76	162	ethylphenol isomer	114	240	isoamyl benzoate
77	163	ethylphenol isomer	115	240	n-hexadecane
78	166	naphthalene	117	240	C ₁₆ H ₃₂ isomer
78A	167	C ₃ -alkyl phenol isomer	119	240	C ₁₇ H ₃₄ isomer
79	169	n-decane	121	240	C ₁₇ H ₃₆ isomer
79A	169	C ₁₂ H ₂₄ isomer	122	240	C ₁₇ H ₃₆ isomer
80	170	n-dodecane	128	240	C ₁₈ H ₃₈ isomer
80A	171	C ₇ -alkyl benzene isomer			
80B	171	dimethylphenol isomer			
80C	172	C ₃ -alkyl phenol isomer			
81	173	C ₁₂ H ₂₄ isomer			
82	174	C ₃ -alkyl phenol isomer			
83	175	C ₇ H ₁₆ O isomer (tent.)			
83A	176	C ₁₃ H ₂₆ isomer			
84	177	C ₁₄ H ₂₈ isomer			
85	179	C ₁₃ H ₂₈ isomer			
86	181	C ₁₃ H ₂₆ isomer			
87	183	undecanone isomer			

a

Sampling was at HL2 (Fig. 12), see Table 16.

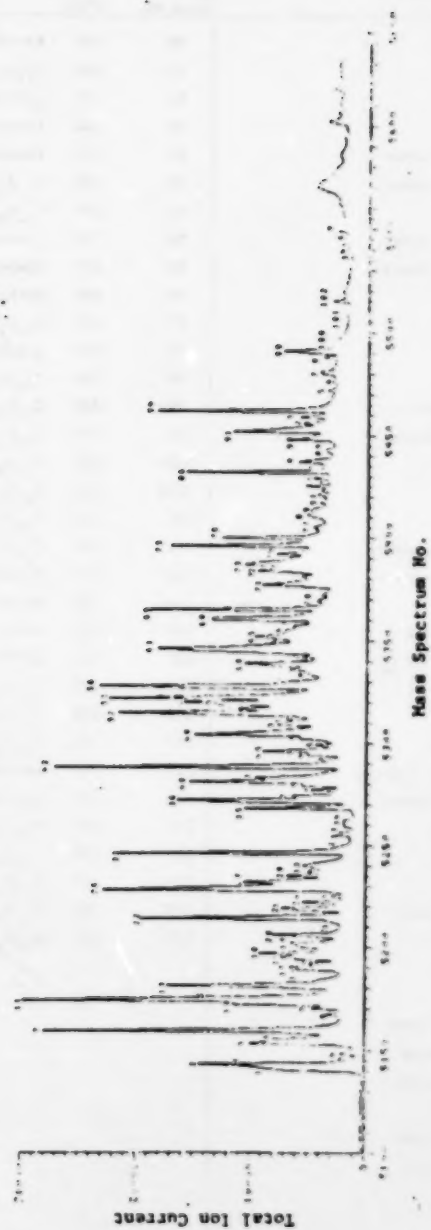


Figure A1. Pollution profile for air sample taken at HL3 (Fig. 12, Table 16).

Table A27. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM HOUSTON, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	23A	80	4-methyl-2-pentanone
2	41	dichlorodifluoromethane	23B	80	C ₈ H ₁₆ isomer
3	43	1-butene	24	81	C ₈ H ₁₈ isomer
3A	43	n-butane	25	82	C ₈ H ₁₈ isomer
4	44	acetaldehyde	26	83	toluene
5	46	isopentane	27	86	C ₈ H ₁₈ isomer
5A	46	CFC1 ₃	28	87	C ₈ H ₁₈ isomer
5B	47	furan + C ₅ H ₁₀ isomer + dimethyl ether	29	88	C ₈ H ₁₆ isomer
6	47	n-pentane + acetone	29A	89	C ₈ H ₁₄ isomer + 2-hexanone
6A	48	diethyl ether	30	90	n-hexanal
7	48	dichloromethane	30A	92	C ₈ H ₁₆ isomer
7A	49	freon 113	31	93	n-octane
7B	50	isopropanol	32	93	tetrachloroethylene
7C	50	ter-butanol	32A	96	C ₈ H ₁₆ isomer
7D	51	methyl ethyl ketone	33A	99	C ₉ H ₂₀ isomer
8	53	2-methylpentane	34	100	C ₉ H ₁₈ isomer
8A	53	crotonaldehyde or C ₄ H ₈ O isomer	34A	101	C ₉ H ₂₀ isomer
8B	54	C ₄ H ₁₀ S isomer (tent.)	34B	103	C ₇ H ₁₄ O isomer
9	55	3-methylpentane	35	104	ethylbenzene
9A	55	n-butanal	36	105	m-xylene
10	56	hexafluorobenzene (sB)	37	107	C ₉ H ₂₀ isomer
11	57	n-hexane	38	108	m-xylene
12	57	chloroform	38A	108	C ₉ H ₂₀ isomer
13	61	perfluorotoluene (sB)	39	109	2-heptanone + styrene
13A	62	methylcyclopentane	39A	110	C ₁₀ H ₂₂ isomer
13B	63	C ₇ H ₁₆ isomer	40	110	p-xylene
13C	63	1,1,1-trichloroethane	40A	111	n-heptanal
13D	64	C ₇ H ₁₄ isomer	41	111	C ₁₀ H ₂₂ isomer
13E	64	C ₅ H ₁₀ O isomer	41A	112	C ₉ H ₁₈ isomer
14	65	benzene	42	114	n-nonane
14A	65	carbon tetrachloride	43	116	C ₁₀ H ₂₀ isomer
15	66	C ₇ H ₁₆ isomer	44	117	isopropylbenzene
16	66	cyclohexane	45	117	C ₁₀ H ₂₂ isomer
16A	67	2-methylhexane	45A	118	C ₂ -alkyl phenol isomer (tent.)
17	68	2,3-dimethylpentane	46	119	C ₁₀ H ₂₂ isomer
18	69	3-methylhexane	46A	120	C ₁₀ H ₂₂ isomer
19	70	n-pentanal	46B	120	C ₃ -alkyl cyclohexane isomer
19A	71	C ₇ H ₁₄ isomer	47	121	C ₁₀ H ₂₂ isomer
19B	72	trichloroethylene	48	122	benzaldehyde
20	73	n-heptane	48A	123	n-propylbenzene
21	74	C ₇ H ₁₂ isomer	49	124	p-ethyltoluene
22	77	methylcyclohexane	50	125	C ₁₀ H ₂₂ isomer
22A	79	C ₈ H ₁₆ isomer	51	126	1,3,5-trimethylbenzene
23	79	C ₈ H ₁₈ isomer	51A	126	cyannobenzene + C ₁₀ H ₂₀ isomer
			52	127	C ₁₁ H ₂₄ isomer
			53	128	C ₁₀ H ₂₂ isomer

(continued)

Table A27 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
53A	129	2-octanone	80	178	C ₆ -alkyl benzene isomer
53B	129	phenol	81	180	C ₁₃ H ₂₆ isomer
54	130	C ₁₀ H ₂₂ isomer	82	181	C ₁₃ H ₂₈ isomer
55	131	n-octanal	83	182	C ₁₁ H ₂₂ O isomer
55A	131	m-ethyltoluene	84	183	C ₁₃ H ₂₄ isomer
56	133	dichlorobenzene isomer	85	184	β-methylnaphthalene
56A	134	n-decane	85A	185	C ₁₃ H ₂₆ isomer
57	135	C ₁₀ H ₂₀ isomer	86	186	n-tridecane
57A	136	1,2,3-trimethylbenzene	87	187	α-methylnaphthalene
58	137	C ₁₁ H ₂₄ isomer	88	188	C ₁₀ H ₂₀ O ₂ isomer (tent.)
59	138	C ₁₁ H ₂₄ isomer	89	191	C ₁₄ H ₃₀ isomer
60	139	C ₉ H ₁₈ O isomer	90	194	butyl butyrate (tent.)
61	140	C ₁₀ H ₂₀ isomer	91	196	C ₁₂ H ₂₄ O ₃ isomer (tent.)
62	141	C ₁₁ H ₂₄ isomer	91A	196	biphenyl
62A	141	C ₁₁ H ₂₂ isomer	92	198	C ₁₂ H ₂₄ O isomer
62B	142	C ₄ -alkyl benzene isomer	93	199	C ₁₂ H ₂₀ O + C ₁₄ H ₂₈ isomers
63	143	acetophenone	94	201	n-tetradecane
63A	143	C ₄ -alkyl benzene isomer	94A	203	C ₁₄ H ₂₈ isomer
64	144	C ₉ H ₁₈ O isomer	95	206	C ₁₅ H ₃₂ isomer
64A	145	C ₁₀ H ₁₈ isomer	96	208	C ₁₄ H ₂₈ isomer
65	146	C ₁₁ H ₂₄ isomer	97	210	C ₈ -alkyl benzene isomer
65A	146	C ₁₁ H ₂₂ isomer	97A	210	C ₁₅ H ₃₂ isomer
66	147	C ₄ -alkyl benzene isomer	97B	212	C ₁₃ H ₂₆ O isomer
67	148	2-nonanone	98	214	C ₁₅ H ₃₀ isomer
67A	149	C ₁₀ H ₁₂ + C ₁₁ H ₂₀ isomers	99	215	n-pentadecane
68	150	n-nonanal	102	227	C ₁₆ H ₃₄ isomer
68A	151	C ₁₁ H ₂₂ isomer	102A	228	C ₆ -alkyl phenol isomer (tent.)
69	152	n-undecane	103	239	C ₁₄ H ₂₈ O isomer
70	154	C ₆ -alkyl benzene isomer	104	239	C ₄ -alkyl phenol isomer
70A	156	C ₁₁ H ₂₂ isomer	105	240	C ₁₆ H ₃₄ isomer
71	158	dimethylphenol isomer			
71A	159	C ₅ -alkyl benzene isomer			
71B	160	C ₅ -alkyl benzene isomer			
71C	161	C ₄ -alkyl benzene isomer			
72	162	ethylphenol isomer			
72A	163	C ₁₂ H ₂₄ isomer			
73	164	C ₁₂ H ₂₆ isomer			
74A	166	C ₃ -alkyl phenol isomer			
74B	167	C ₁₂ H ₂₂ isomer			
75	168	n-decanal			
75A	169	C ₁₂ H ₂₄ isomer			
76	170	n-dodecane			
77	172	C ₁₃ H ₂₈ isomer			
77A	174	C ₁₂ H ₂₄ isomer			
78	175	C ₈ H ₁₄ O ₂ isomer (tent.)			

^aSampling was at HL3 (Fig. 12) as described in Table 16.

Table A28. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM PASADENA, TX⁸

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	25	86	C ₈ H ₁₈ isomer
2A	43	1-butene + n-butane	26	88	C ₈ H ₁₈ isomer
2B	44	ethanol (tent.)	26A	89	C ₈ H ₁₆ isomer
3	44	acetaldehyde	26B	90	2-hexanone
4	46	isopentane	27	90	n-hexanal
4A	47	propanal + propenal	27A	91	C ₈ H ₁₆ isomer
5	47	acetone + furan	27B	93	C ₈ H ₁₆ isomer
5A	48	n-pentane	28	93	n-octane
5B	48	dimethyl ether + diethyl ether	28A	94	tetrachloroethylene
5C	49	C ₅ H ₁₀ isomer	28B	97	C ₈ H ₁₆ isomer
5D	49	dichloromethane	29	100	C ₉ H ₂₀ isomer
6A	50	C ₆ H ₁₄ isomer + tet-butanol	30	100	C ₈ H ₁₆ isomer
6B	51	isopropanol	31	101	C ₉ H ₂₀ isomer
7	52	ethyl acetate + methyl ethyl ketone	32	103	C ₉ H ₁₈ isomer
7A	53	C ₃ H ₄ O isomer	32A	104	C ₇ H ₁₄ O isomer
8	53	2-methylpentane	33	104	ethylbenzene
9	55	3-methylpentane	33A	105	C ₉ H ₁₈ isomer
9A	55	n-butanal	33B	106	C ₉ H ₂₀ isomer
10	56	hexafluorobenzene (aW)	34	106	p-xylene
11	57	n-hexane	34A	107	phenylacetylene
12	57	chloroform	35	107	C ₉ H ₂₀ isomer
13	60	perfluorotoluene (aW)	36	109	C ₉ H ₂₀ isomer
13A	61	methylcyclopentane	36A	110	C ₉ H ₁₈ isomer
13B	62	1,1,1-trichloroethane	37	110	styrene + 2-heptanone
13C	63	C ₇ H ₁₀ O isomer	37A	111	C ₉ H ₁₆ isomer
14	64	benzene	38	111	o-xylene
14A	65	carbon tetrachloride + C ₇ H ₁₆ isomer	38A	112	dimethylheptene isomer
15	66	cyclohexane	39	112	methylethylcyclohexane isomer
16	67	2-methylhexane	40	113	C ₉ H ₁₈ isomer
16A	67	2,3-dimethylpentane	41	114	C ₉ H ₁₈ isomer
17	68	3-methylhexane	42	115	n-nonane
18	70	n-pentanal	43	116	C ₉ H ₁₈ isomer
18A	70	C ₇ H ₁₄ isomer	44	117	C ₁₀ H ₂₀ isomer
18B	71	trichloroethylene	44A	118	isopropylbenzene
18C	71	C ₇ H ₁₂ isomer	45	119	hexahydroindan + C ₁₀ H ₂₂ isomers
18D	72	C ₇ H ₁₄ isomer	45A	120	C ₃ -alkyl cyclohexane isomer
19	73	n-heptane	46	121	C ₁₀ H ₂₂ isomer
20	77	methylcyclohexane	46A	121	C ₁₀ H ₂₀ isomer
20A	79	C ₈ H ₁₆ isomer	47	122	propylcyclohexane
21	79	4-methyl-2-pentanone + C ₈ H ₁₈ isomer	48	123	C ₁₀ H ₂₂ isomer
22	81	C ₈ H ₁₆ isomer	48A	124	benzaldehyde
23	83	acetic acid	49	124	C ₁₀ H ₂₀ isomer
24	84	toluene	49A	125	n-propylbenzene
			49B	125	C ₁₀ H ₂₀ + C ₁₀ H ₂₂ isomers
			50	126	p-ethyltoluene

(continued)

Table A28 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
51	127	C ₁₀ H ₂₂ isomer	73A	156	C ₁₁ H ₁₈ + C ₅ alkyl benzene isomers
51A	128	1,3,5-trimethylbenzene	74	157	C ₄ -alkyl benzene isomer
52	128	C ₁₀ H ₂₂ isomer	75	158	C ₁₂ H ₂₆ isomer
53	129	C ₁₀ H ₂₀ isomer	76	159	C ₁₁ H ₂₀ isomer
53A	130	<i>o</i> -ethyltoluene	76A	159	C ₁₂ H ₂₀ isomer
54	130	C ₁₀ H ₂₂ isomer	77	160	C ₁₂ H ₂₆ + C ₅ -alkyl benzene isomers
55	131	C ₁₀ H ₁₈ isomer	77A	160	C ₁₁ H ₁₄ isomer
56	132	C ₁₀ H ₂₀ isomer	77B	161	C ₁₂ H ₂₂ isomer
57	133	1,2,4-trimethylbenzene + C ₁₀ H ₂₀ isomer	78	161	C ₁₁ H ₂₂ + C ₁₁ H ₂₀ isomer
57A	134	C ₁₁ H ₂₂ isomer	78A	162	C ₁₃ H ₂₂ isomer
57B	135	C ₁₀ H ₂₀ isomer	79	162	C ₅ -alkyl benzene + C ₁₂ H ₂₄ isomers
58	136	<i>n</i> -decane	79A	163	C ₄ -alkyl benzene isomer
58A	138	C ₁₀ H ₂₀ isomer	80	163	C ₅ -alkyl benzene isomer
58B	138	C ₁₀ H ₁₈ + C ₁₁ H ₂₂ isomers	80A	164	C ₅ -alkyl benzene + C ₁₂ H ₂₄ isomers
59	139	1,2,3-trimethylbenzene + C ₄ -alkyl benzene isomer	81	164	C ₁₂ H ₂₆ isomer
59A	139	C ₁₁ H ₂₂ isomer	81A	165	C ₅ -alkyl benzene isomer
59B	140	C ₁₁ H ₂₀ isomer	82	165	C ₁₂ H ₂₄ isomer
60	141	C ₁₁ H ₂₄ isomer	82A	166	C ₁₂ H ₂₆ isomer
60A	142	C ₁₀ H ₂₀ isomer	83	166	C ₅ -alkyl benzene isomer
61	142	C ₁₁ H ₂₀ isomer	83A	167	C ₁₂ H ₂₆ isomer
62	143	C ₄ -alkyl cyclohexane isomer	84	167	C ₁₁ H ₁₈ isomer
62A	143	C ₄ -alkyl benzene isomer	84A	168	C ₁₂ H ₂₂ isomer
62B	144	C ₁₁ H ₂₂ isomer	85	168	naphthalene
63	144	C ₄ -alkyl benzene isomer	85A	169	C ₆ -alkyl benzene isomer
63A	145	C ₄ -alkyl benzene isomer	85B	169	C ₁₁ H ₂₀ isomer
64	146	C ₄ -alkyl benzene + C ₁₁ H ₂₂ isomers	86	170	C ₁₂ H ₂₄ isomer
65	147	C ₁₁ H ₂₄ isomer	86A	170	C ₁₂ H ₂₀ isomer
66	148	C ₁₀ H ₁₈ isomer	86B	171	C ₁₂ H ₂₄ isomer
66A	148	C ₁₁ H ₂₄ isomer	87	172	<i>n</i> -dodecane
67	149	C ₁₁ H ₂₀ + C ₄ -alkyl benzene isomers	87A	172	C ₁₂ H ₂₄ isomer
68	149	C ₁₁ H ₂₄ isomer	87B	173	C ₁₂ H ₁₆ isomer
68A	150	C ₁₁ H ₂₂ + C ₁₂ H ₂₆ isomers	88	174	C ₁₃ H ₂₈ isomer
68B	150	C ₁₂ H ₂₂ isomer	88A	176	C ₁₂ H ₂₂ isomer
69	151	C ₁₁ H ₂₂ isomer	89	176	C ₁₃ H ₂₈ isomer
70	151	C ₁₁ H ₂₀ isomer	90	177	C ₁₃ H ₂₆ + C ₅ -alkyl benzene isomers
70A	152	C ₁₁ H ₂₂ isomer	90A	178	C ₁₃ H ₂₄ isomer
71	152	C ₁₁ H ₂₂ isomer	91	178	C ₁₃ H ₂₆ isomer
71A	153	C ₅ -alkyl benzene isomer	92	179	C ₄ -alkyl cyclohexane isomer
72	154	C ₅ -alkyl benzene + C ₁₁ H ₂₂ isomers	92A	180	C ₁₃ H ₂₆ isomer
73	155	<i>n</i> -undecane	92B	180	C ₁₃ H ₂₄ isomer

(continued)

Table A28 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
92C	181	C ₁₃ H ₂₈ isomer			
93	181	C ₁₃ H ₂₆ isomer			
94	182	C ₁₄ H ₃₀ isomer			
94A	182	C ₁₃ H ₂₆ isomer			
95	183	C ₁₃ H ₂₈ isomer			
96	184	C ₁₃ H ₂₈ isomer			
97	184	C ₁₄ H ₃₀ isomer			
97A	185	C ₁₃ H ₂₄ isomer			
97B	186	C ₁₃ H ₂₂ isomer			
98	186	C ₁₃ H ₂₆ + C ₁₄ H ₂₈ isomers			
99	187	n-tridecane			
99A	188	C ₁₄ H ₂₆ isomer			
99B	189	C ₁₄ H ₂₈ isomer			
100	189	C ₁₄ H ₃₀ isomer			
101	190	C ₁₄ H ₂₆ + C ₁₄ H ₃₀ isomers			
101A	191	C ₁₄ H ₂₈ isomer			
101B	192	C ₁₄ H ₂₈ isomer			
102	193	C ₁₄ H ₃₀ isomer			
103	194	C ₇ -alkyl cyclohexane isomer			
104	196	C ₁₄ H ₃₀ isomer			
104A	198	C ₁₃ H ₂₆ O isomer			
105	199	C ₁₄ H ₃₀ isomer			
105A	200	C ₁₄ H ₂₈ isomer			
106	202	n-tetradecane			
106A	204	C ₁₅ H ₃₀ isomer			
106B	206	C ₁₆ H ₃₂ isomer			
107	224	diethyl phthalate			
108	228	butyl butyrate			
109	240	n-heptadecane			

^a Sampling was at PL1 (Fig. 13) as described in Table 16.

Table A29. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM PASADENA, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	CO ₂	20B	87	C ₈ H ₁₆ isomer
1A	42	dichlorodifluoromethane	21	88	C ₆ H ₁₂ O isomer
2	44	1-butene	21A	89	2-hexanone + C ₈ H ₁₆ isomer
2A	45	n-butane	22	90	C ₈ H ₁₈ isomer
3	46	diacetylene	22A	90	n-hexanal
3A	46	acetaldehyde	23	91	C ₈ H ₁₈ isomer
3B	47	trichlorofluoromethane	23A	92	C ₈ H ₁₆ isomer
4	48	propanal + propanal + furan + dimethyl ether	24	93	n-octane
4A	48	acetone	24A	94	tetrachloroethylene
5	50	dichloromethane + freon 113 (BKG)	24B	94	C ₈ H ₁₆ isomer
5A	51	isopropanol + <u>ter</u> -butanol	25	95	C ₉ H ₁₈ isomer
5B	52	isobutanol	26	97	C ₉ H ₂₀ isomer
5C	53	2,5-dihydrofuran or butenal	26A	97	C ₉ H ₁₈ isomer
5D	54	dichloropropene isomer (tent.)	27	98	2,4-dimethylheptane
5E	55	C ₈ H ₁₄ isomer	28	100	2,6-dimethylheptane
6	56	n-butanal	28A	100	C ₉ H ₁₈ isomer
7	56	hexafluorobenzene (eF)	29	101	2,5-dimethylheptane
8	57	n-hexane	30	103	C ₉ H ₁₈ isomer
9	58	chloroform	30A	103	C ₈ H ₁₆ isomer
9A	59	methyl ethyl ketone	30B	104	2,3-dimethylheptane + C ₉ H ₁₈ isomer
10	60	perfluorotoluene (eF)	31	104	ethylbenzene
10A	61	methylcyclopentane	31A	105	C ₉ H ₁₈ isomer
10B	61	1,2-dichloroethane	32	106	ethylheptane isomer
11	62	C ₇ H ₁₆ isomer	32A	106	m-xylene
11A	63	C ₇ H ₁₄ isomer	33	107	phenylacetylene
12	64	benzene	33A	107	C ₉ H ₂₀ isomer
12A	66	carbon tetrachloride	34	108	3-methyloctane
12B	67	C ₇ H ₁₆ isomer	34A	108	C ₉ H ₂₀ isomer
13	68	butyl formate or C ₈ H ₁₂ O isomer	34B	109	C ₉ H ₁₈ isomer
13A	69	C ₅ H ₁₀ O ₂ isomer (tent.)	35	109	styrene or cyclooctatetraene + 2-heptanone
14	70	3-methylbutanal	35A	110	C ₉ H ₁₈ isomer
14A	71	n-pentanal + C ₇ H ₁₄ isomer	36	110	p-xylene
14B	71	2-butanol	37	111	n-heptanal
15	72	n-heptane	38	112	C ₉ H ₁₈ isomer + dichloropro- pane isomer
15A	73	C ₇ H ₁₄ isomer	38A	113	C ₉ H ₁₈ isomer
15B	73	methyl methacrylate	39	114	n-nonane
16	77	ethylcyclohexane	40	115	C ₉ H ₁₈ isomer
17	78	4-methyl-2-pentanone	41	117	isopropylbenzene
18	81	acetic acid (tent.) + 3- methyl-3-pentanone	42	117	C ₁₀ H ₂₂ isomer
18A	83	C ₈ H ₁₆ isomer	42A	118	C ₉ H ₁₈ isomer
19	84	toluene	43	119	isobutyl methacrylate
19A	85	C ₈ H ₁₆ isomer + unknown	44	121	C ₁₀ H ₂₀ isomer
20	86	C ₈ H ₁₈ isomer	45	122	benzaldehyde + C ₁₀ H ₂₂ isomer
20A	87	C ₈ H ₁₈ isomer			

(continued)

Table A29 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
45A	123	n-propylbenzene	74	168	C ₁₂ H ₂₄ isomer + n-decanal
45B	123	C ₁₀ H ₂₀ isomer	75	170	n-dodecane
46	124	m-ethyltoluene	75A	171	C ₁₂ H ₂₄ isomer
47	125	C ₁₀ H ₂₀ isomer	76	173	C ₁₃ H ₂₈ isomer
47A	126	C ₁₁ H ₂₂ isomer	77	177	C ₁₂ H ₂₄ isomer
47B	126	p-ethyltoluene + C ₁₀ H ₂₀ + C ₁₀ H ₂₂ isomers	77A	178	C ₁₂ H ₂₂ isomer
48	127	n-butyl methacrylate	77B	179	C ₆ -alkyl benzene isomer
49	128	C ₃ -alkyl benzene + C ₁₁ H ₂₂ isomer	78	180	C ₁₁ H ₂₄ isomer
50	129	C ₈ H ₁₆ O isomer	79	182	C ₁₃ H ₂₈ isomer
50A	131	methylstyrene isomer	80	183	C ₁₀ H ₁₈ O ₂ isomer
51	131	C ₃ -alkyl benzene isomer + n-octanal	81	184	C ₁₃ H ₂₆ isomer
51A	132	C ₁₀ H ₂₀ isomer	82	186	n-tridecane
52	133	dichlorobenzene isomer (tent.)	82A	189	C ₁₄ H ₃₀ isomer
53	134	n-decane	83	192	silane compound
53A	135	C ₁₁ H ₂₂ isomer	85	201	n-tetradecane
54	137	1,2,3-trimethylbenzene	88	218	saturated alkyl alcohol isomer
55	138	C ₁₀ H ₂₀ isomer	89	224	alkyl phthalate isomer
55A	138	C ₁₁ H ₂₄ isomer	90	227	alkyl butyrate isomer
55B	139	C ₁₁ H ₂₂ isomer	91	228	n-pentadecane
56	139	C ₁₁ H ₂₄ isomer	92	237	alkyl ketone isomer
57	140	indene	93	240	C ₁₇ H ₃₄ isomer
58	142	C ₄ -alkyl benzene + C ₁₂ H ₂₄ isomer	94	240	n-heptadecane
58A	142	C ₄ -alkyl benzene + C ₁₁ H ₂₂ isomers			
59	143	acetophenone			
59A	144	C ₉ H ₁₈ isomer			
60	145	C ₉ H ₁₈ O isomer (tent.)			
61	146	C ₁₂ H ₂₄ isomer			
62	147	C ₄ -alkyl benzene + C ₁₁ H ₂₄ isomers			
63	148	2-nonanone			
64	150	n-nonanal			
65	151	C ₁₁ H ₂₂ isomer			
66	153	n-undecane			
66A	154	C ₁₂ H ₂₄ isomer			
67	155	C ₆ -alkyl benzene isomer			
68	156	C ₁₁ H ₂₀ isomer			
69	159	dimethylphenol isomer			
70	161	C ₅ -alkyl benzene isomer			
71	162	C ₁₂ H ₂₆ isomer			
72	163	C ₁₂ H ₂₄ isomer			
73	166	naphthalene			

^a Sampling was at PL3 (Fig. 13), see Table 16.

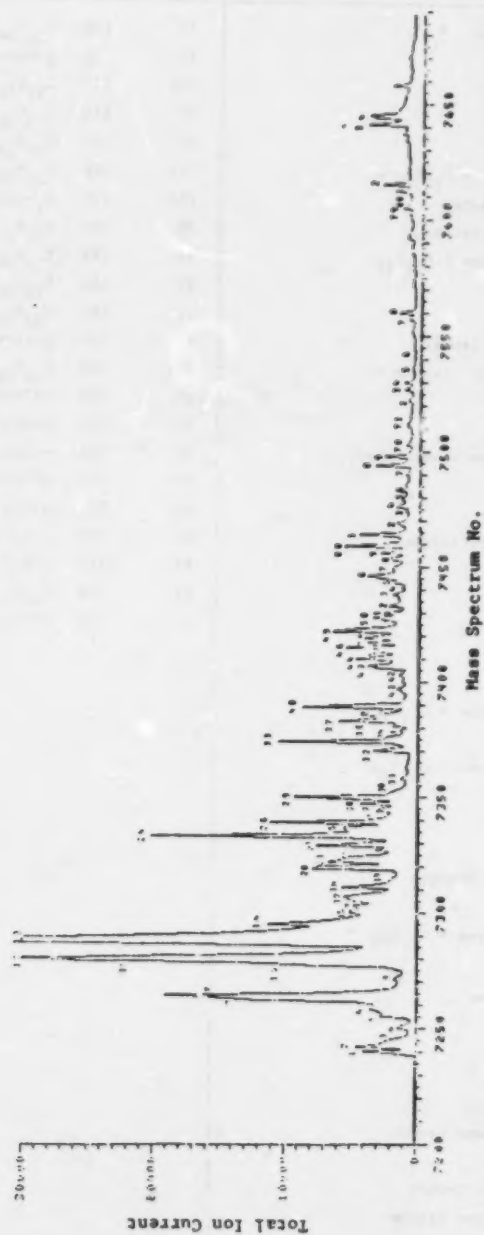


Figure A2. Profile of ambient air sample taken at DSL1 (Fig. 13, Table 16).

Table A30. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM DEER PARK, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	22A	84	C ₈ H ₁₆ isomer
2	42	dichlorodifluoromethane	22B	85	C ₈ H ₁₆ isomer
3A	45	1-butene	23	85	1,1,2-trichloroethane
4	46	chloroethane + acetaldehyde	24	87	toluene
4A	47	isopentane	24A	88	C ₈ H ₁₆ isomer
5	48	trichlorofluoromethane	25	89	C ₈ H ₁₈ isomer
6	50	acetone	25A	89	methylethylcyclopentane isomer
7	52	isopropanol + dichloromethane	26	90	methylethylcyclopentane isomer
8	53	freon 113 (BKG) + chloropro- pane isomer	26A	92	C ₈ H ₁₆ isomer
8A	55	C ₄ H ₈ O isomer	27	93	n-hexanal + C ₈ H ₁₆ isomer
8B	56	dichloroethylene	28	94	C ₈ H ₁₈ O isomer
8C	56	isobutanal	28A	95	C ₈ H ₁₆ isomer
9	57	1,1-dichloroethane	29	96	n-octane
9A	57	2-methylpentane	30	97	n-butyl acetate (tent.)
9B	58	dichloropropene (tent.) isomer	30A	98	C ₉ H ₁₈ isomer
9C	58	3-methylpentane	31	100	C ₉ H ₁₈ isomer
9D	59	n-butanal	31A	102	ethylcyclohexane
10	60	hexafluorobenzene (eW)	32	106	ethylbenzene
10A	60	methyl ethyl ketone	33	107	p-xylene
11	61	n-hexane	34	108	C ₉ H ₂₀ isomer
12	61	chloroform	34A	108	C ₉ H ₁₈ isomer
12A	62	2-butanol	35	109	C ₉ H ₂₀ isomer
12B	63	C ₄ H ₆ O isomer (tent.)	35A	110	C ₇ H ₁₄ O isomer
12C	64	perfluorotoluene (eW)	36	110	styrene
13	65	1,2-dichloroethane	36A	111	C ₁₀ H ₂₂ isomer
13A	67	methylcyclopentane	37	111	p-xylene
14	68	benzene	37A	112	n-heptanal
14A	69	carbon tetrachloride + C ₇ H ₁₆ isomer	38	112	C ₉ H ₁₈ isomer
14B	70	cyclohexane	39	113	dichloropropene
15	71	2-methylhexane	40	114	n-nonane
15A	71	2,3-dimethylpentane	40A	116	C ₉ H ₁₈ isomer
16	72	3-methylhexane	40B	116	C ₁₀ H ₂₀ isomer
16A	73	dichloropropane + C ₇ H ₁₄ isomers	40C	117	isopropylbenzene + C ₁₀ H ₂₂ isomer
17	74	dichloropropene isomer	41	118	C ₁₀ H ₂₂ isomer
17A	74	n-pentanal	41A	119	C ₈ H ₁₀ O isomer (tent.)
17B	75	trichloroethylene + C ₇ H ₁₄ isomer	41B	120	C ₁₀ H ₂₀ isomer
18	76	n-heptane	41C	121	C ₉ H ₁₈ isomer
19	78	C ₈ H ₁₈ isomer	42	122	C ₁₀ H ₂₂ isomer
19A	79	C ₈ H ₁₆ isomer	43	123	benzaldehyde
20	80	methylcyclohexane	43A	123	n-propylbenzene
21	82	4-methyl-2-pentanone	43B	124	C ₁₀ H ₂₂ isomer
22	83	C ₈ H ₁₈ isomer	44	125	p-ethyltoluene
			44A	126	C ₁₀ H ₂₂ isomer
			45	127	1,3,5-trimethylbenzene
			46	128	C ₁₁ H ₂₄ isomer

(continued)

Table A30 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
47	129	C ₁₀ H ₂₂ isomer	69A	170	C ₁₂ H ₂₄ isomer
47A	129	C ₁₀ H ₂₀ isomer	70	171	C ₁₃ H ₂₈ isomer
48	130	C ₁₀ H ₂₂ isomer	72	181	C ₁₃ H ₂₈ isomer
49	131	<i>o</i> -ethyltoluene + <i>n</i> -octanal	72A	182	C ₁₁ H ₂₂ O isomer
49A	132	C ₁₀ H ₂₀ isomer	73	185	C ₁₃ H ₂₆ isomer
50	134	<i>n</i> -decane + dichlorobenzene (tent.) isomer	74	187	<i>n</i> -tridecane
50A	135	C ₄ -alkyl benzene isomer	76	191	C ₁₂ H ₂₄ isomer (tent.)
51	135	C ₁₀ H ₂₀ isomer	77	199	C ₁₄ H ₂₈ isomer
52	137	1,2,3-trimethylbenzene	78	200	<i>m</i> -tetradecane
52A	137	C ₄ -alkyl benzene isomer	78A	212	C ₁₅ H ₃₂ isomer
52B	138	C ₁₁ H ₂₄ isomer	79	222	diethyl phthalate
53	139	C ₁₁ H ₂₄ isomer	81	226	C ₁₆ H ₃₄ isomer
54	141	C ₁₁ H ₂₂ isomer	82	227	<i>n</i> -hexadecane
55	142	C ₄ -alkyl benzene + C ₁₁ H ₂₄ isomers	82A	228	C ₁₅ H ₃₂ isomer
56	143	acetophenone	82B	238	C ₁₅ H ₃₀ O isomer (tent.)
56A	144	C ₄ -alkyl benzene isomer	83	240	<i>n</i> -hexadecane
56B	144	C ₁₁ H ₂₂ isomer	84	240	C ₁₈ H ₃₈ isomer
57	145	C ₉ H ₁₈ O isomer (tent.)			
57A	146	C ₁₀ H ₁₈ isomer			
58	147	C ₄ -alkyl benzene isomer			
59	148	C ₄ -alkyl benzene isomer			
60	150	<i>n</i> -nonanal			
60A	151	C ₁₁ H ₂₂ isomer			
60B	152	C ₄ -alkyl benzene isomer			
61	153	<i>n</i> -undecane			
61A	154	C ₅ -alkyl benzene isomer			
61B	155	<i>n</i> -pentylbenzene			
62	155	tetramethylbenzene isomer			
62A	156	C ₁₂ H ₂₄ isomer			
62B	156	C ₁₁ H ₂₀ isomer			
63	157	C ₁₂ H ₂₅ + C ₅ -alkyl benzene isomers			
64	157	C ₁₂ H ₂₆ isomer			
64A	158	C ₁₁ H ₂₂ isomer			
65	159	methylindan isomer			
65A	159	C ₄ -alkyl benzene isomer			
65B	160	C ₅ -alkyl benzene isomer			
66	161	C ₁₂ H ₂₆ isomer			
66A	163	C ₅ -alkyl benzene isomer			
67	164	2-decanone + naphthalene			
67A	165	C ₁₂ H ₂₄ isomer			
68	166	<i>n</i> -decanal			
68A	167	C ₁₂ H ₂₄ isomer			
69	168	<i>n</i> -dodecane			

^aSampling was on Shell property at DSL1 (Fig. 13) as described in Table 16.

Table A31. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM DEER PARK, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	39	CO ₂	26	99	C ₈ H ₁₆ isomer
3	48	acetaldehyde	27	104	C ₈ H ₁₆ isomer
6	50	propanal + propenal	28	106	ethylbenzene
6A	50	isopentane + dimethyl ether	29	108	p-xylene
7	51	acetone	30	109	C ₉ H ₂₀ isomer
8	52	dichloromethane	31	110	C ₇ H ₁₄ O isomer
8B	54	isopropanol	31A	111	C ₉ H ₂₀ isomer
8C	55	C ₄ H ₈ O isomer	31B	112	styrene
8D	56	2-methylpentane	32	112	p-xylene
8E	57	C ₄ H ₈ O isomer	33	113	n-heptanal + C ₉ H ₁₆ isomer
8F	58	3-methylpentane	34	113	C ₉ H ₁₈ isomer
8G	59	n-butanal	35	116	n-nonane
9	59	hexafluorobenzene (eB)	36	120	C ₁₀ H ₂₂ isomer
10	60	n-hexane	37	121	C ₁₀ H ₂₂ isomer
11	61	chloroform	37A	122	C ₉ H ₁₈ isomer
12	63	perfluorotoluene (eB)	38	123	C ₁₀ H ₂₂ isomer
12A	64	methylcyclopentane	39	124	benzaldehyde
12B	65	1,1,1-trichloroethane	39A	125	n-propylbenzene
13	66	benzene	40	126	p-ethyltoluene
13A	67	C ₇ H ₁₆ isomer + carbon tetrachloride	40A	128	1,3,5-trimethylbenzene
13B	68	cyclohexane	41	129	C ₁₁ H ₂₄ isomer
14	69	2-methylhexane	41A	130	C ₉ H ₁₈ isomer + anisole
14A	69	2,3-dimethylpentane	42	130	C ₁₀ H ₂₂ isomer
14B	70	C ₇ H ₁₄ isomer	42A	131	phenol
14C	70	3-methylhexane	43	131	C ₉ H ₂₀ isomer
15	71	4-methyl-2-pentanone	43A	132	C ₁₀ H ₁₈ isomer
15B	72	C ₇ H ₁₄ isomer	44	133	n-octanal + 1,2,4-trimethylbenzene
15C	72	C ₇ H ₁₂ isomer	44A	134	C ₁₀ H ₂₀ isomer
15D	73	n-pentanal + C ₇ H ₁₄ isomer	45	135	n-decane + dichlorobenzene isomer
16	74	n-heptane	46	138	1,2,3-trimethylbenzene
16A	75	C ₈ H ₁₆ isomer	46A	139	C ₁₀ H ₂₀ isomer
17	77	methylcyclohexane	47	140	C ₁₁ H ₂₄ isomer
17A	79	C ₇ H ₁₂ isomer	48	141	C ₁₂ H ₂₆ isomer
17B	79	C ₈ H ₁₈ isomer	49	144	C ₄ -alkyl benzene isomer
18	80	C ₈ H ₁₈ isomer	50	145	acetophenone
19	83	C ₆ H ₁₂ O isomer	50A	147	C ₁₁ H ₂₄ isomer
19A	85	C ₇ H ₁₄ isomer	51	148	cresol isomer
20	83	acetic acid	51A	148	C ₄ -alkyl benzene isomer
21	86	toluene	51B	149	C ₁₁ H ₂₂ isomer
22	88	C ₈ H ₁₈ isomer	52	150	2-nonanone
23	90	C ₈ H ₁₈ isomer	52A	150	C ₄ -alkyl benzene isomer
23A	91	C ₈ H ₁₆ isomer	53	152	n-nonanal
24	92	n-hexanal	53A	153	C ₁₁ H ₂₂ isomer
25	96	n-octane	54	154	n-undecane
25A	96	tetrachloroethylene (tent.)			

(continued)

Table A31 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
55	157	C ₄ -alkyl benzene isomer			
55A	158	C ₂ -alkyl phenol isomer			
56	160	C ₂ -alkyl phenol isomer			
56A	162	C ₁₀ H ₁₂ isomer			
57	163	C ₂ -alkyl phenol isomer			
58	164	C ₄ -alkyl benzene + dimethyl- phenol isomers			
58A	165	C ₅ -alkyl benzene isomer			
59	167	2-decanone			
59A	168	C ₃ -alkyl phenol isomer + naphthalene			
60	169	n-decanol			
60A	171	C ₁₂ H ₂₄ isomer			
61	172	n-dodecane			
62	173	C ₃ -alkyl phenol isomer			
62A	176	C ₁₂ H ₂₄ isomer			
63	179	C ₄ -alkyl phenol isomer			
63A	181	C ₁₂ H ₂₄ isomer			
64	184	2-undecanone			
65	185	C ₁₀ H ₁₈ O ₂ isomer			
66	186	8-methylnaphthalene + C ₁₃ H ₂₆ isomer			
67	187	n-tridecane			
68	189	α-methylnaphthalene			
70	196	isobutyl butyrate			
71	197	n-butyl butyrate			
73	201	C ₁₄ H ₂₈ isomer			
74	202	n-tetradecane			
74A	206	C ₁₄ H ₂₈ isomer			
75	212	C ₁₅ H ₃₂ isomer			
75A	213	C ₁₅ H ₃₀ isomer			
76	214	C ₁₃ H ₂₆ O isomer			
76A	125	C ₁₅ H ₃₀ isomer			
77	217	n-pentadecane			
79	225	diethyl phthalate			
80	229	C ₁₆ H ₃₀ O ₄ isomer			
81	230	n-hexadecane			
81A	236	C ₁₈ H ₃₈ isomer			
83	240	C ₁₅ H ₃₀ O isomer			
84	240	C ₁₇ H ₃₄ isomer			
85	240	n-heptadecane			
86	240	C ₁₈ H ₃₈ isomer			
87	240	C ₁₈ H ₃₈ isomer			
88	240	C ₁₈ H ₃₆ isomer			
89	240	n-octadecane			

^a Sampling was on Shell property at DSL2 (Fig. 13) as described in Table 16.

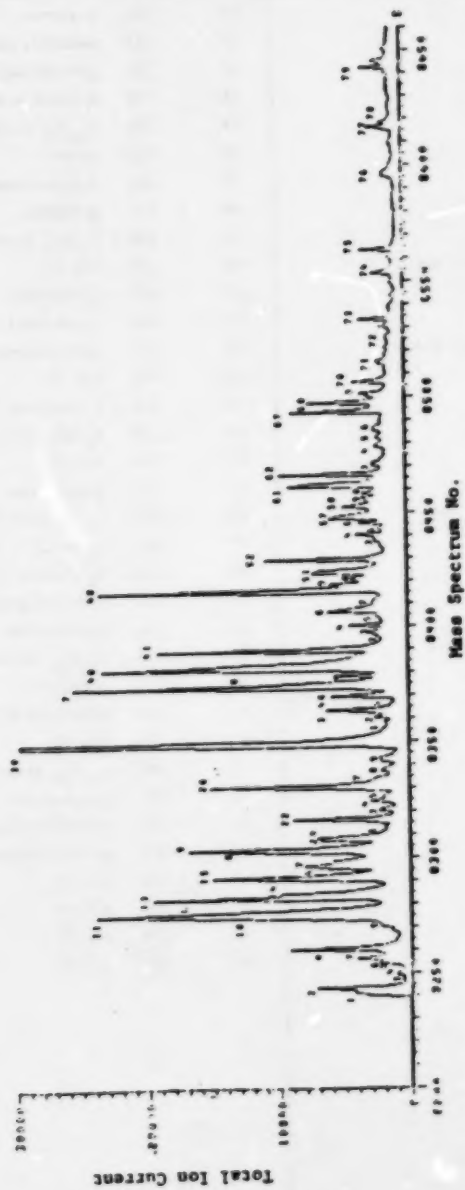


Figure A3. Profile of ambient air taken at DDL1 (Fig. 13, Table 16).

Table A32. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM DEER PARK, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	carbon dioxide	45	122	n-pinene
3	43	vinyl chloride	46	123	benzaldehyde
4	44	acetaldehyde	47	126	o-ethyltoluene
5	47	isopentane	48	128	n-hexyl acrylate (tent)
6A	48	propanal	49	129	C ₁₀ H ₂₂ isomer
6B	48	acrolein	50	130	phenol
7	49	acetone	51	132	1,2,4-trimethylbenzene
8	50	methylene chloride	52	134	n-decane
9	55	vinyl acetate (tent)	53	138	C ₁₁ H ₂₄ isomer
10	57	perfluorobenzene (ext. std.)	54	140	m/e 57
11	58	n-hexane	55	141	C ₄ -benzene isomer
12	58	chloroform	56	142	C ₄ -benzene isomer
13	61	perfluorotoluene (ext. std.)	57	144	acetophenone
14	62	1,2-dichloroethane	58	146	m/e 57
15A	66	benzene	59	148	C ₄ -benzene isomer
15B	66	carbon tetrachloride	60	149	C ₄ -benzene isomer
16	67	cyclohexane	61	150	m/e 57
17	68	n-butyl formate (tent)	62	153	n-undecane
18	71	sec-butyl acrylate (tent)	63	155	C ₄ -benzene isomer
19	72	trichloroethylene	64	161	C ₅ -benzene isomer
20A	74	n-heptane	65	162	C ₆ -benzene isomer
20B	74	methyl methacrylate	66	164	pentachlorobutadiene isomer
21	76	C ₈ H ₁₈ isomer	67	166	naphthalene
22	78	C ₇ H ₁₄ isomer	68	168	C ₁₃ H ₂₈ isomer
23	80	C ₈ H ₁₈ isomer	69	170	n-dodecane
24	82	acetic acid	70	173	hexachloro-1,3-butadiene
25	83	C ₈ H ₁₆ isomer	71	178	m/e 59
26	85	toluene	72	182	C ₁₄ H ₃₀ isomer
27	87	C ₈ H ₁₈ isomer	73	186	n-tridecane
28	89	dibromochloromethane	74	196	n-butyl-n-butyrate (tent)
30A	94	n-octane	75	202	n-tetradecane
30B	94	tetrachloroethylene	76	216	m/e 59
31	98	C ₉ H ₂₀ isomer	77	227	m/e 71
32	100	C ₉ H ₂₀ isomer	78	229	m/e 57
33	101	chlorobenzene	79	240	m/e 83
34	102	C ₉ H ₂₀ isomer			
35	103	C ₉ H ₁₈ isomer			
36	105	ethylbenzene			
37	107	p-xylene			
38	108	phenylacetylene			
39	109	C ₉ H ₂₀ isomer			
40	111	n-butyl acrylate (tent)			
41	115	n-nonane			
42	118	cumene			
43	118	C ₁₀ H ₂₂ isomer			
44	120	isobutyl methacrylate (tent)			

^aSampling was on Diamond Shamrock property at DDL1 (Fig. 13) as described in Table 16.

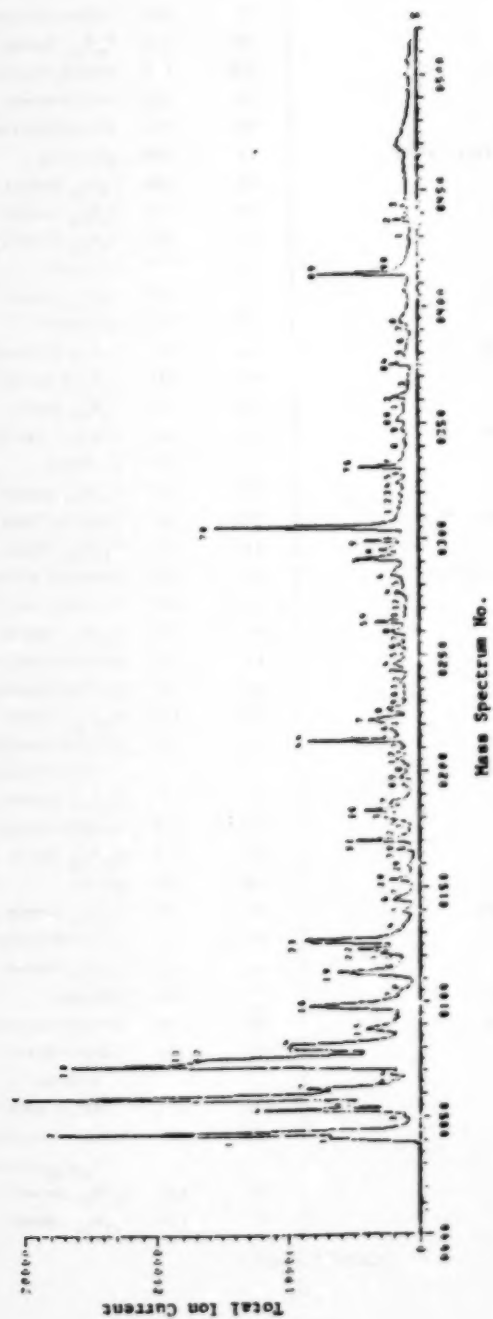


Figure A4. Profile of ambient air sample taken at DTL2 (Fig. 13, Table 16).

Table A33. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM DEER PARK, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	27	93	tetrachloroethylene
2A	43	n-propane	27A	96	trichloropropene isomer (tent.)
2B	43	1-butene	29	100	chlorobenzene
3	45	acetaldehyde	29A	102	C ₈ H ₁₆ isomer
4	46	isopentane	29B	103	trichloropropene isomer
4B	47	C ₅ H ₁₀ isomer	30	103	ethylbenzene
5	48	acetone + n-pentane	30A	104	dichlorobutene isomer (tent.)
5A	48	dimethyl ethyl + diethyl ether	31	105	p-xylene
5B	49	dichloromethane	32	106	C ₉ H ₂₀ isomer
7	51	ter-butanol (tent.)	32A	107	C ₉ H ₁₈ isomer
8	53	2-methylpentane	33	108	C ₉ H ₂₀ isomer
8A	54	C ₄ H ₈ O isomer	33A	109	styrene
9	55	3-methylpentane	34	109	C ₉ H ₂₀ isomer
9A	55	n-butanal	34A	110	m-xylene
10	56	hexafluorobenzene (aF)	35	110	1,1,2,2-tetrachloroethane
11	57	n-hexane	35A	111	C ₇ H ₁₄ O isomer
12	57	chloroform	35B	111	C ₉ H ₁₈ isomer
13	59	perfluorotoluene (aF)	36	112	cis-1,3-dichloropropene
14	60	methylcyclopentane	37	113	n-nonane
14A	61	1,2-dichloroethane	37A	115	C ₁₀ H ₂₀ isomer
14B	62	1,1,1-trichloroethane + C ₆ H ₈ isomer (tent.)	37B	117	isopropylbenzene
14C	63	1,1-dichloropropene (tent.)	38	117	C ₁₀ H ₂₂ isomer
15	64	benzene	39	119	isobutyl methacrylate
15A	65	carbon tetrachloride	39A	119	2,3-dichloro-1-propanol
15B	65	cyclohexane	40	120	C ₁₀ H ₂₂ isomer
15C	66	C ₇ H ₁₆ isomer	41	123	benzaldehyde + n-propylbenzene
15D	68	C ₇ H ₁₆ isomer	42	124	p-ethyltoluene
16	69	1,2-dichloropropane	42A	125	C ₁₀ H ₂₂ isomer
16A	70	dichloropropene isomer	43	126	1,3,5-trimethylbenzene + 1,2- bis-(2-chloroethoxy)ethane
17	72	C ₇ H ₁₆ isomer	44	127	C ₁₁ H ₂₄ isomer
18	73	C ₇ H ₁₆ isomer	44A	128	o-ethyltoluene
18A	75	acetic acid (tent.)	45	128	C ₁₁ H ₂₄ isomer
18B	76	C ₇ H ₁₄ isomer	45A	129	phenol
19	76	dichloropropene isomer	46	129	C ₁₁ H ₂₄ isomer
19A	77	methylcyclohexane	47	131	1,2,4-trimethylbenzene
20	79	C ₈ H ₁₈ isomer	47A	131	C ₁₀ H ₂₂ isomer
21	81	dichloropropene isomer	48	133	n-decane
22	82	1,1,2-trichloroethane	48A	134	dichlorobenzene isomer
23	83	toluene	49	136	1,3-dichloro-2-methylene propane
23A	85	C ₈ H ₁₆ isomer	49A	136	C ₄ -alkyl benzene isomer
23B	86	C ₈ H ₁₈ isomer	49B	137	1,2,3-trimethylbenzene + C ₁₀ H ₂₀ isomer
24	87	C ₈ H ₁₈ isomer	50	137	C ₁₁ H ₂₄ isomer
24A	88	C ₈ H ₁₆ isomer	51	138	C ₁₁ H ₂₄ isomer
25	90	C ₆ H ₁₂ O isomer			
26	92	n-octane			

(continued)

Table A33 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
51A	139	indan + C ₁₁ H ₂₂ isomer	78	191	C ₁₄ H ₂₈ isomer
51B	139	C ₁₁ H ₂₄ isomer	79	193	C ₁₄ H ₃₀ isomer
52	140	trichloro-2-methylpropane isomer	79A	194	C ₈ -alkyl benzene isomer
53	142	C ₄ -alkyl benzene + C ₁₁ H ₂₄	80	195	isobutyl isobutyrate
53A	142	C ₁₁ H ₂₂ isomer	81A	197	2-dodecanone
54	143	acetophenone + C ₄ -alkyl benzene isomer	81B	198	C ₆ -alkyl phenol isomer
55	145	C ₁₁ H ₂₄ isomer	81C	199	C ₁₄ H ₂₈ isomer
56	147	C ₄ -alkyl benzene isomer + tetrachlorobutadiene isomer	82	200	n-tetradecane
57	148	C ₄ -alkyl benzene + C ₉ H ₁₈ O isomers	83	202	C ₁₅ H ₃₀ isomer
57A	149	C ₁₁ H ₂₂ + methylindan isomers	83A	203	dimethyl phthalate
58	150	n-nonanal	84	207	biphenylene
58A	151	C ₁₁ H ₂₂ isomer	86	211	C ₁₃ H ₂₆ isomer
59	152	n-undecane	87	214	n-pentadecane + C ₁₅ H ₂₄ O isomer
60	154	C ₄ -alkyl benzene isomer	89	226	alkyl butyrate isomer
61	155	C ₁₂ H ₂₄ isomer	90	227	C ₁₆ H ₃₄ isomer
62	156	C ₁₁ H ₂₂ isomer	92	238	C ₁₄ H ₂₈ O isomer
63	157	pentachlorobutadiene isomer	93	240	C ₁₇ H ₃₆ isomer
63A	158	C ₂ -alkyl phenol isomer			
63B	158	C ₁₀ H ₁₂ + C ₁₁ H ₁₈ isomers			
63	159	C ₁₁ H ₂₂ isomer			
64A	159	C ₆ -alkyl benzene isomer			
64B	160	C ₅ -alkyl benzene isomer			
65	161	C ₁₀ H ₁₂ isomer			
66	163	pentachlorobutadiene isomer			
66A	164	C ₂ -alkyl phenol isomer			
66B	165	trichlorobenzene isomer			
67	166	naphthalene			
68	168	n-decanal			
68A	169	C ₁₂ H ₂₄ isomer			
69	170	n-dodecane			
70	172	1,3-hexachlorobutadiene			
71	176	C ₁₃ H ₂₆ isomer			
72	178	C ₆ -alkyl benzene isomer			
73	179	C ₁₂ H ₂₆ isomer			
73A	179	C ₁₃ H ₂₈ isomer			
74	181	2-undecanone			
74A	183	C ₁₃ H ₂₆ isomer			
75	183	8-methylnaphthalene			
75A	184	C ₁₃ H ₂₆ isomer			
76	185	n-tridecane			
77	186	6-methylnaphthalene			

^aSampling was off Tidal road at DTL2 (Fig. 13) as described in Table 16.

Table A34. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM DEER PARK, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	23	95	n-octane
3	43	1-butene	24	97	n-butyl acetate
3A	44	n-butane	24A	98	C ₈ H ₁₆ isomer
4	45	acetaldehyde	24B	101	C ₇ H ₁₄ O isomer
4A	46	isopentane	24C	102	C ₈ H ₁₆ isomer
5A	47	propanal + propenal + dimethyl ether	24D	102	C ₉ H ₂₀ isomer
6	48	acetone	25	105	ethylbenzene
6A	49	diethyl ether (tent.)	26	107	p-xylene
6B	50	dichloromethane	26A	108	C ₉ H ₂₀ isomer
8	52	isopropanol	26B	110	C ₉ H ₂₀ isomer
8A	54	C ₄ H ₈ O isomer	26C	110	styrene
8B	55	2-methylpentane	27	111	C ₇ H ₁₄ O ₂ isomer
8C	56	C ₄ H ₈ O isomer	27A	111	C ₇ H ₁₄ O + C ₁₀ H ₂₂ isomers
9	57	3-methylpentane	28	112	o-xylene
9A	58	n-butanal	28A	112	n-heptanal
10	58	hexafluorobenzene (eE)	28B	113	C ₁₀ H ₂₂ isomer
11	59	n-hexane	29	115	n-nonane
12	60	chloroform	29A	117	C ₉ H ₁₈ isomer
13	62	perfluorotoluene (eE)	29B	118	isopropylbenzene
14	63	methylcyclopentane	30	119	C ₁₀ H ₂₂ isomer
14A	64	1,2-dichloroethane	31	120	sec-butyl methacrylate
14B	64	C ₃ H ₆ O ₂ isomer	32	122	C ₁₀ H ₂₂ isomer
14C	65	1,1,1-trichloroethane	33	123	benzaldehyde
15	67	benzene	33A	124	n-propylbenzene
15A	68	carbon tetrachloride	34	125	p-ethyltoluene
16	69	cyclohexane	35	126	C ₁₀ H ₂₀ isomer
16A	70	2-methylhexane	36	127	n-butyl methacrylate
16B	71	3-methylhexane	36A	129	phenol
16C	72	n-pentanal	37	130	C ₁₁ H ₂₄ isomer
17	73	C ₇ H ₁₄ isomer	38	132	C ₃ -alkyl benzene isomer
18	75	n-heptane	39	134	n-decane
19	79	methylcyclohexane	40	135	C ₁₁ H ₂₄ isomer
19A	80	C ₈ H ₁₄ isomer	41	137	C ₁₁ H ₂₄ isomer
19B	80	C ₈ H ₁₆ isomer	41A	138	1,2,3-trimethylbenzene
19C	81	C ₈ H ₁₈ isomer	42	138	C ₁₀ H ₂₀ isomer
19D	82	C ₈ H ₁₈ isomer	43	140	C ₁₂ H ₂₆ isomer
19E	84	C ₈ H ₁₆ isomer	43A	141	C ₉ H ₁₆ O ₂ isomer
20	86	toluene	44	141	C ₁₁ H ₂₄ isomer
20A	87	C ₈ H ₁₆ isomer	45	142	C ₁₂ H ₂₆ + C ₄ -alkyl benzene isomers
20B	88	C ₈ H ₁₈ isomer	46	143	acetophenone
20C	89	acetic acid	46A	144	C ₄ -alkyl benzene isomer
21	90	C ₈ H ₁₈ isomer	47	145	C ₈ H ₁₄ O ₂ isomer
21A	91	C ₈ H ₁₆ isomer	48	146	C ₁₁ H ₂₄ isomer
21B	92	C ₆ H ₁₂ O isomer	48A	148	2-nonanone
22	92	n-hexanal	49	149	C ₄ -alkyl benzene isomer

(continued)

Table A34 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
50	150	n-nonanal			
51	152	n-undecane			
51A	154	C ₄ -alkyl benzene isomer			
52	155	C ₁₁ H ₂₂ isomer			
53	157	dimethylphenol isomer			
53A	159	C ₆ -alkyl benzene isomer			
54	160	dimethylphenol isomer			
55	163	C ₁₂ H ₂₄ isomer			
55A	165	C ₄ -alkyl benzene isomer			
56	165	naphthalene + 2-decanone			
56A	166	C ₃ -alkyl phenol isomer			
57	167	n-decanal			
57A	168	C ₁₂ H ₂₄ isomer			
58	169	n-dodecane			
58A	170	C ₃ -alkyl phenol isomer			
59	172	C ₃ -alkyl phenol + C ₁₃ H ₂₆ isomers			
60	176	C ₄ -alkyl phenol isomer (tent.)			
61	180	C ₁₃ H ₂₆ isomer			
62	181	C ₁₁ H ₂₂ O isomer			
63	183	C ₁₃ H ₂₆ isomer			
64	185	n-tridecane			
64A	185	methylnaphthalene isomer			
66	192	isobutyl butyrate			
67	194	n-butyl butyrate			
68	196	C ₁₄ H ₃₀ isomer			
69	198	C ₁₄ H ₂₈ isomer			
70	199	n-tetradecane			
70A	212	C ₁₅ H ₃₀ isomer			
71	215	unknown			
72	216	unknown			
73	222	diethyl phthalate			
74	226	C ₁₆ H ₃₀ O ₄ isomer			
75	227	n-hexadecane			
77	238	C ₁₅ H ₃₀ O isomer			
78	239	C ₁₇ H ₃₄ isomer			

^a Sampling was off Tidal Road at DTL3 (Fig. 13) as described in Table 16.

Table A35. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM DEER PARK, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	CO ₂	23	82	C ₈ H ₁₈ isomer
3	44	1-butene	23A	82	4-methyl-2-pentanone
3A	45	n-butane	24	83	C ₈ H ₁₆ isomer
4	46	acetaldehyde	24A	84	C ₇ H ₁₄ isomer
5	48	isopentane	25	85	C ₇ H ₁₂ + C ₈ H ₁₈ isomers
5A	49	C ₃ H ₁₀ isomer	25A	86	C ₈ H ₁₆ isomer
6	49	propanal + propenal + furan dimethyl ether	26	86	toluene
6A	50	acetone + C ₅ H ₁₂ isomer	27	89	2,5-dimethylhexane
6B	51	diethyl ether (tent)	28	90	2,4-dimethylhexane
7	51	dichloromethane + C ₅ H ₁₂ isomer	28A	91	C ₈ H ₁₆ isomer
8	53	C ₆ H ₁₄ isomer + isopropanol	28B	91	C ₈ H ₁₄ + C ₆ H ₁₂ O isomers
8A	54	ter-butanol	29	92	C ₈ H ₁₈ isomer
8B	55	2-methylpropanol	29A	93	n-hexanal
8C	55	2-methylpentane	30	93	dimethylcyclohexane isomer
9	56	cyclopentane (tent)	31	95	n-octane
9A	57	2-methylpropanal	31A	96	tetrachloroethylene
10	58	3-methylpentane	32	97	C ₈ H ₁₆ + C ₈ H ₁₄ isomers
10A	58	n-butanol	33	98	C ₈ H ₁₆ isomer
11	59	hexafluorobenzene (eW)	34	99	C ₉ H ₂₀ isomer
12	60	n-hexane	35	100	C ₉ H ₂₀ isomer
13	61	chloroform	35A	101	C ₉ H ₁₈ isomer
13A	62	methyl ethyl ketone	36	102	C ₉ H ₂₀ isomer
13B	63	C ₆ H ₁₂ isomer	37	103	C ₉ H ₂₀ isomer
14	63	perfluorotoluene (eW)	37A	104	C ₉ H ₁₈ isomer
14A	64	methylcyclopentane	38	106	ethylbenzene
14B	67	3-methylbutanal	39	108	p-xylene
15	68	benzene	40	109	C ₉ H ₂₀ isomer
15A	69	C ₇ H ₁₆ isomer + carbon tetra- chloride	41	110	C ₉ H ₂₀ isomer
16	69	cyclohexane	42	111	styrene + 2-heptanone
17	70	2-methylhexane	42A	112	C ₉ H ₁₈ isomer
17A	71	2,3-dimethylpentane + C ₇ H ₁₄ isomer	43	113	o-xylene
18	72	3-methylhexane	44	114	C ₉ H ₁₈ isomer
19	73	n-pentanal	45	115	C ₉ H ₁₈ isomer
19A	74	1-heptene	46	116	n-nonane
19B	74	1,2-dimethylcyclopentane	47	117	C ₉ H ₁₉ isomer
19C	75	C ₇ H ₁₄ isomer	48	119	isopropylbenzene
20	76	n-heptane	49	120	C ₁₀ H ₂₂ isomer
21	77	C ₇ H ₁₄ isomer	49A	121	C ₁₀ H ₂₂ isomer
21A	78	C ₇ H ₁₂ isomer	50	121	C ₁₀ H ₂₂ isomer
21B	79	C ₇ H ₁₀ isomer	50A	122	C ₁₀ H ₂₂ isomer
22	80	methylcyclohexane	51	122	propylcyclohexane
22A	81	C ₈ H ₁₆ isomer	52	123	C ₁₀ H ₂₂ isomer
22B	81	3-methylpentanal	53	124	benzaldehyde
			54	125	n-propylbenzene
			55	126	n-ethyltoluene
			56	128	1,3,5-trimethylbenzene

(continued)

Table A35 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
57	128	C ₁₀ H ₂₂ isomer	82	157	C ₁₂ H ₂₆ + C ₁₁ H ₂₀ isomers
57A	129	C ₁₁ H ₂₄ isomer	83	158	C ₁₂ H ₂₄ isomer
58	130	o-ethyltoluene	83A	159	C ₅ -alkyl benzene isomer
58A	130	C ₁₀ H ₂₂ isomer	83B	159	dimethylphenol + dimethylindan isomers
58B	131	2-octanone	84	160	ethylindan + C ₅ -alkyl benzene isomers
59	131	phenol	85	160	C ₅ -alkyl benzene isomer
59A	132	C ₁₀ H ₁₈ isomer	96	161	C ₁₁ H ₂₀ + C ₁₂ H ₂₄ isomers
59B	132	o-methylstyrene	96A	161	C ₁₁ H ₁₂ isomer
59C	133	n-octanal	87	162	C ₆ -alkyl benzene isomer
60	133	1,2,4-trimethylbenzene	87A	162	tetramethylbenzene isomer
60A	134	C ₁₀ H ₂₀ isomer	88	163	dimethylphenol + C ₅ alkyl benzene isomers
61	135	n-decane	89	164	1,2,3,4-tetrahydronaphthalene
61A	136	isobutylbenzene	89A	164	C ₅ -alkyl benzene + C ₁₂ H ₂₆ isomers
62	136	C ₁₀ H ₂₂ isomer	90	165	C ₁₂ H ₂₄ isomer
62A	138	ter-butylbenzene	90A	165	C ₆ -alkyl benzene isomer
63	138	1,2,3-trimethylbenzene + C ₁₁ H ₂₄ isomer	91	166	C ₅ -alkyl benzene isomer
63A	139	o-xylene + C ₁₁ H ₂₂ isomer	91A	166	C ₁₂ H ₂₆ isomer
64	139	C ₁₁ H ₂₄ isomer	92	167	2-decanone
64A	140	C ₁₁ H ₂₂ isomer	93	168	naphthalene
65	141	indan	94	168	C ₁₁ H ₁₄ + C ₆ -alkyl benzene isomers
65A	141	C ₆ -alkyl benzene isomer	95	169	n-decanal + C ₁₂ H ₂₄ isomers
66	142	butylcyclohexane	96	170	C ₅ -alkyl benzene + C ₁₂ H ₂₂ isomers
67	143	m-propyltoluene	96A	170	C ₁₂ H ₂₄ isomer
68	144	C ₆ -alkyl benzene isomer	97	171	n-dodecane
69	145	p-propyltoluene	98	172	C ₅ -alkyl benzene isomer
70	146	n-butylbenzene + C ₁₁ H ₂₂ isomer	98A	172	C ₁₃ H ₂₆ + C ₆ -alkyl benzene isomers
70A	146	C ₁₁ H ₂₄ isomer	98B	173	methyl-1,2,3,4-tetrahydro- naphthalene isomer
71	147	C ₆ -alkyl benzene isomer	98C	173	C ₁₃ H ₂₈ isomer
72	148	C ₁₁ H ₂₄ isomer	99	174	1,3-hexachlorobutadiene
73	148	1,3-dimethyl-5-ethylbenzene	99A	174	C ₁₃ H ₂₆ isomer
74	149	2-nonanone + methyl indan isomer	99B	175	C ₁₃ H ₂₈ isomer
75	150	1,4-dimethyl-2-ethylbenzene	100	176	C ₁₁ H ₁₄ + C ₁₃ H ₂₆ isomers
75A	150	methyl indan isomer	101	177	C ₁₃ H ₂₈ + C ₆ -alkyl benzene isomers
75B	151	C ₁₂ H ₂₆ isomer	101A	178	C ₁₃ H ₂₈ isomer
76	151	n-nonanal	102	178	C ₁₃ H ₂₆ + C ₁₁ H ₁₄ isomers
77	152	C ₁₁ H ₂₂ isomer	102A	179	C ₆ -alkyl benzene isomer
77A	153	C ₆ -alkyl benzene isomer	103	180	C ₁₃ H ₂₈ isomer
78	153	C ₅ -alkyl benzene			
79	154	n-undecane			
79A	155	C ₁₁ H ₂₂ isomer			
79B	155	C ₁₂ H ₂₆ + C ₅ -alkyl benzene isomers			
80	156	1,2,4,5-tetramethylbenzene			
81	157	C ₅ -alkyl benzene isomer			

(continued)

Table A35 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
104	181	C ₁₄ H ₃₀ isomer			
104A	182	C ₁₃ H ₂₆ isomer			
105	182	C ₆ -alkyl benzene isomer			
105A	183	C ₁₃ H ₂₈ isomer			
106	183	2-undecanone			
106A	185	C ₆ -alkyl benzene + C ₁₃ H ₂₆ isomers			
107	186	8-methylnaphthalene			
107A	186	C ₁₃ H ₂₆ + C ₁₃ H ₂₄ isomers			
108	187	n-tridecane			
108A	188	C ₁₃ H ₂₆ isomer			
109	188	α-methylnaphthalene			
110	190	C ₁₄ H ₃₀ isomer			
111	192	C ₁₄ H ₂₈ isomer			
111A	194	C ₇ -alkyl cyclohexane isomer			
112	195	C ₁₄ H ₃₀ isomer			
113	196	C ₇ -alkyl benzene isomer			
113A	197	C ₁₄ H ₃₀ isomer			
114	197	C ₁₄ H ₂₈ isomer			
114A	198	C ₁₅ H ₃₂ isomer			
115	199	dodecanone isomer			
116	200	C ₁₄ H ₂₈ isomer			
116A	201	C ₁₅ H ₃₂ isomer			
117	202	n-tetradecane			
117A	205	dimethylnaphthalene isomer			
118	206	dimethyl phthalate			
119	207	C ₁₅ H ₃₀ isomer			
120	209	biphenylene			
121	211	C ₁₆ H ₃₄ isomer			
121A	212	C ₁₅ H ₃₀ isomer			
122	215	C ₁₅ H ₃₀ isomer			
123	216	n-pentadecane			
125	219	unknown			
126	224	diethyl phthalate			
127	226	C ₁₄ H ₂₈ O isomer			
128	227	butyl n-butyrate			
129	229	n-hexadecane			
130	236	C ₁₈ H ₃₈ isomer			
131	240	C ₁₇ H ₃₄ isomer			
132	240	n-heptadecane			
135	240	unknown			

^a Sampling was at DTL4 (Fig. 13) as described in Table 16.

Table A36. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM LAPORTE, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	31	101	chlorobenzene
2A	43	1-butene	31A	102	C ₉ H ₂₀ isomer
3	44	n-butane	31B	103	C ₉ H ₂₀ isomer
5	46	isopentane	31C	103	C ₉ H ₁₈ isomer
7	48	acetone	32	105	ethylbenzene
7A	49	n-pentane	33	107	p-xylene
7B	49	dimethyl ether + diethyl ether	34	108	C ₉ H ₂₀ isomer
9	54	C ₅ H ₁₀ isomer	35	109	C ₉ H ₂₀ isomer
10	55	2-methylpentane	35A	110	m-xylene
11	56	3-methylpentane	36	111	styrene or cyclooctatetraene
12	58	hexafluorobenzene (eW)	37	112	o-xylene
12A	58	n-hexane	38	113	C ₉ H ₁₈ isomer
13	59	chloroform	39	115	n-nonane
14	62	perfluorotoluene (eW)	40	116	C ₉ H ₁₈ isomer
14A	63	methylcyclopentane	40A	118	C ₉ H ₁₈ isomer
15	64	1,1,1-trichloroethane	41	118	isopropylbenzene
16	66	benzene	42	119	C ₁₀ H ₂₂ isomer
16A	67	carbon tetrachloride	43	121	C ₁₀ H ₂₂ isomer
16B	68	cyclohexane	43A	121	C ₉ H ₁₈ isomer
17	68	2-methylhexane	43B	122	propylcyclohexane
17A	70	2,3-dimethylpentane	44	122	C ₁₀ H ₂₂ isomer
18	70	3-methylhexane	44A	123	C ₁₀ H ₂₀ isomer
18A	72	C ₇ H ₁₄ isomer	45	124	benzaldehyde
19	73	2,2,4-trimethylpentane	46	125	n-propylbenzene
20	75	n-heptane	47	126	n-ethyltoluene
20A	76	C ₇ H ₁₄ isomer	48	127	p-ethyltoluene
21	79	methylcyclohexane	49	128	C ₁₁ H ₂₄ isomer
21A	80	C ₈ H ₁₆ isomer	50	130	1,3,5-trimethylbenzene
22	81	4-methyl-2-pentanone	50A	130	phenol
22A	82	C ₈ H ₁₈ isomer	51	131	C ₁₀ H ₂₀ isomer
22B	83	C ₈ H ₁₆ isomer	51A	132	C ₁₀ H ₁₈ isomer
22C	83	acetic acid (tent.)	52	133	o-ethyltoluene
22D	84	C ₈ H ₁₆ isomer	52A	134	C ₁₀ H ₂₀ isomer
23	86	toluene	52B	135	dichlorobenzene isomer (tent.)
24	88	C ₈ H ₁₈ isomer	53	135	n-decane
25	89	C ₈ H ₁₈ isomer	54	136	C ₁₀ H ₂₀ isomer
26	91	C ₈ H ₁₆ isomer	54A	138	C ₄ -alkyl benzene isomer
27	92	n-hexanal	55	138	1,2,3-trimethylbenzene
27A	93	C ₈ H ₁₆ isomer	56	139	C ₁₀ H ₂₀ isomer
27B	94	C ₈ H ₁₄ isomer	56A	140	C ₁₁ H ₂₄ isomer
27C	94	C ₈ H ₁₆ isomer	57	140	indan
28	95	n-octane	57A	141	C ₁₁ H ₂₄ isomer
28A	96	tetrachloroethylene	57B	142	butylcyclohexane + indene
28B	96	C ₈ H ₁₆ isomer	58	143	C ₁₁ H ₂₄ isomer
29	97	C ₉ H ₁₈ isomer	59	143	C ₄ -alkyl benzene isomer
30A	100	C ₉ H ₂₀ isomer	60	144	p-propyltoluene

(continued)

Table A36 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
60A	144	n-butylbenzene	85	192	C ₁₃ H ₂₆ isomer
61	145	acetophenone + n-propyltoluene	86	195	n-butyl-nor-butyrate
61A	146	C ₁₂ H ₂₄ isomer	87	197	2,2,4-trimethylpenta-1,3-diol 1-isobutyrate
62	147	p-cresol + C ₁₀ H ₁₈ isomer	88	199	C ₁₄ H ₃₀ isomer
63	148	C ₄ -alkyl benzene + C ₁₁ H ₂₂ isomers	88A	200	C ₆ -alkyl phenol isomer
64	149	dimethylethylbenzene isomer	89	201	C ₁₄ H ₂₈ isomer
65	150	dimethylethylbenzene + C ₁₂ H ₂₆ isomers	90	202	n-tetradecane
65A	150	methylindan	91	204	C ₁₅ H ₃₀ isomer
65B	151	C ₁₁ H ₂₂ isomer	92	205	dimethyl phthalate
66	152	n-nonanal	92A	206	C ₁₅ H ₃₀ isomer
66A	153	C ₁₁ H ₂₂ isomer	93	207	C ₁₅ H ₃₂ isomer
67	154	n-undecane	93A	208	C ₁₅ H ₃₀ isomer
67A	155	C ₁₂ H ₂₄ isomer	95	211	C ₁₆ H ₃₄ isomer
68	156	C ₄ -alkyl benzene + C ₁₂ H ₂₆ isomers	95A	212	C ₁₆ H ₃₂ isomer
68A	157	1,2,4,5-tetramethylbenzene	95B	213	C ₁₅ H ₃₀ isomer
69	157	C ₁₁ H ₂₀ isomer	96	215	C ₁₅ H ₃₀ isomer
70	159	dimethylphenol isomer	96A	216	n-pentadecane
70A	161	methylindan isomer	97	217	2,6-di-tert-butyl-4-methyl phenol
70B	162	C ₄ -alkyl benzene isomer	101	221	C ₁₆ H ₃₂ isomer
71	163	ethylphenol isomer	101A	223	C ₁₆ H ₃₄ isomer
72	164	dimethylphenol isomer	102	225	diethyl phthalate
72A	166	naphthalene	103	228	nor-decyl thiol nor-butyrate (tent.) + C ₁₆ H ₃₂ isomer
73	167	C ₃ -alkyl phenol isomer	104	230	n-hexadecane
74	169	n-decanal	105	232	C ₁₇ H ₃₄ isomer
74A	169	C ₁₂ H ₂₄ isomer	107	237	C ₁₈ H ₃₈ isomer
75	170	n-dodecane	108	240	C ₁₇ H ₃₄ isomer
75A	171	ethylphenol isomer	109	240	C ₁₅ H ₃₀ isomer
75B	172	C ₃ -alkyl phenol isomer	110	240	C ₁₈ H ₃₆ isomer
76	174	C ₃ -alkyl phenol + C ₁₂ H ₂₄ isomers	111	240	amyl benzoate + n-heptadecane
76A	175	C ₁₃ H ₂₆ isomer	112	240	C ₁₉ H ₄₀ isomer
77	176	alkyl alcohol (tent.)	113	240	4-methoxy-2,6-di-tert-butylphenol
78	177	C ₁₃ H ₂₆ isomer	114	240	C ₁₈ H ₃₈ isomer
78A	178	C ₂ -alkyl phenol isomer	117	240	n-octadecane
79	179	C ₃ -alkyl phenol isomer	125	240	dibutyl phthalate
80	183	undecanone isomer			
81	185	8-methylnaphthalene			
81A	186	C ₁₃ H ₂₆ isomer			
82	187	n-tridecane			
83	188	o-methylnaphthalene			
84	189	2-ethyl-4-methyl-1,3-dioxolane (tent.)			
85	192	C ₁₃ H ₂₆ isomer			

^a Sampling was at LL1 (Fig. 16), see Table 16.

Table A37. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM LAPORTE, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1A	41	carbon dioxide	39	127	1,3,5-trimethylbenzene
1B	41	dimethyl ether	40	128	C ₁₀ H ₂₂ isomer
2A	42	methyl chloride	41	130	<i>o</i> -ethyltoluene
2B	42	difluorodichloromethane	42	131	phenol
3	44	propane	43	133	1,2,4-trimethylbenzene
4	46	acetaldehyde	44A	135	<i>n</i> -decane
5	47	isopentane	44B	135	<i>m</i> -dichlorobenzene
6	48	trichlorofluoromethane	45	136	C ₄ -alkyl benzene isomer
7	49	acetone	46	138	1,2,3-trimethylbenzene
9	52	m/e 59	47	139	C ₄ -alkyl benzene isomer
10	54	C ₅ H ₁₀ isomer	48	140	<i>o</i> -dichlorobenzene
11	56	C ₆ H ₁₄ isomer	49	141	C ₉ H ₁₀ isomer
12	57	perfluorobenzene (aE)	50	142	trimethylhexanol isomer
13A	58	<i>n</i> -hexane	51	143	C ₄ -alkyl benzene isomer
13B	58	chloroform	52	144	C ₄ -alkyl benzene isomer
14	62	perfluorotoluene (aE)	53	146	C ₄ -alkyl benzene isomer
15	63	1,1,1-trichloroethane	54	147	<i>p</i> -cresol
16A	66	benzene	55	148	C ₄ -alkyl benzene isomer
16B	66	carbon tetrachloride	56	150	C ₄ -alkyl benzene isomer
16C	66	cyclohexane	57	152	C ₁₂ H ₂₆ isomer
17	68	C ₇ H ₁₆ isomer	58	153	<i>n</i> -undecane
18	70	C ₇ H ₁₆ isomer	59	155	C ₄ -alkyl benzene isomer
19	72	3-methylbutanal	60	157	C ₄ -alkyl benzene isomer
20A	74	trichloroethylene	61	159	dimethylphenol isomer
20B	74	<i>n</i> -heptane	62	162	C ₄ -alkyl benzene isomer
20C	74	isopropylamine (tent.)	63	163	C ₅ -alkyl benzene isomer
21	78	C ₇ H ₁₄ isomer	64	164	C ₅ -alkyl benzene isomer
22	80	methyl isobutyl ketone	65	167	naphthalene
23	85	toluene	66	169	trimethylphenol isomer
24	87	acetic acid	67	171	<i>n</i> -dodecane
25	91	dimethylpropiolactone isomer (tent.)	68	174	hexachloro-1,3-butadiene
26A	94	<i>n</i> -octane	69	175	m/e 59
26B	94	tetrachloroethylene	70	177	m/e 101
27	99	m/e 131	71	179	C ₅ -alkyl benzene isomer
28	102	chlorobenzene	72	181	C ₅ -alkyl benzene isomer
29	106	ethylbenzene	73	183	C ₁₄ H ₃₀ isomer
30	107	<i>p</i> -xylene	74	186	2-methylnaphthalene
31	109	C ₉ H ₂₀ isomer	75	187	<i>n</i> -tridecane
32	110	styrene	76	189	1-methylnaphthalene
33	112	<i>o</i> -xylene	77	190	m/e 87
34	115	<i>n</i> -nonane	78	195	2-butyl- <i>n</i> -butyrate (tent.)
35	118	cumene	79	197	<i>n</i> -butyl- <i>n</i> -butyrate (tent.)
36	123	benzaldehyde	80	200	C ₁₄ H ₂₈ isomer
37	124	<i>n</i> -propylbenzene	81	202	<i>n</i> -tetradecane
38	126	<i>m</i> -ethyltoluene	82	211	C ₁₅ H ₃₂ isomer
			83	216	2,6-di- <i>i</i> -butyl- <i>p</i> -cresol

(continued)

Table A37 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
84	218	m/e 39			
85	225	diethylphthalate			
86	227	m/e 71			
87	229	C ₁₅ H ₃₂ isomer			

^aSampling was at LL2 (Fig. 16), see Table 16.

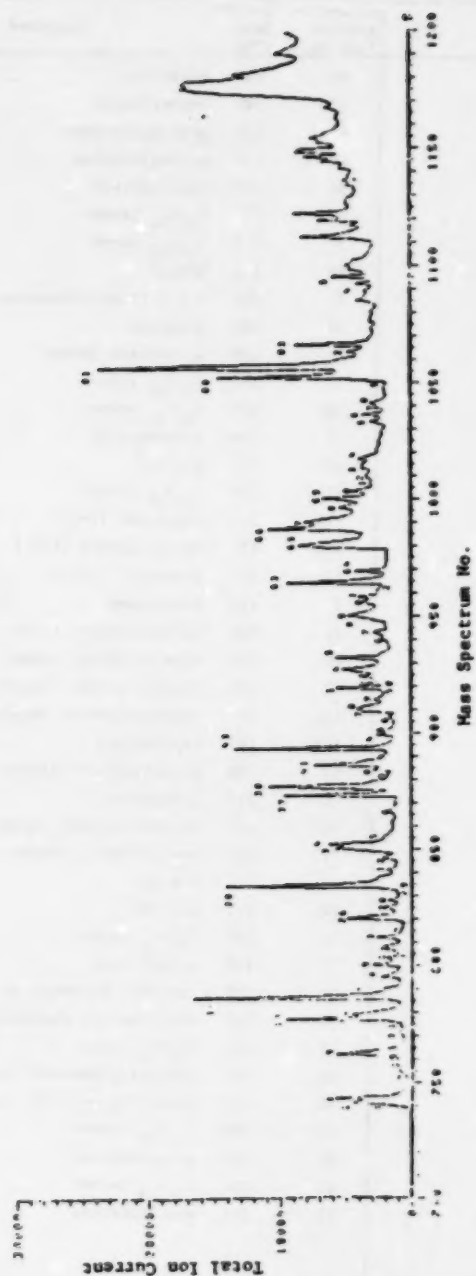


Figure A5. Profile of ambient air sample taken at LL3 (Fig. 16, Table 16).

Table A38. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM LAPORTE, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	argon	46	122	<i>n</i> -pinene
2	42	carbon dioxide	47	124	benzaldehyde
4	46	acetaldehyde	48	125	<i>n</i> -propylbenzene
5	47	isopentane	49	126	<i>m</i> -ethyltoluene
7A	49	propanal	50	127	benzonitrile
7B	49	acrolein	51	129	C ₁₁ H ₂₄ isomer
8	50	acetone	52	130	C ₁₀ H ₂₂ isomer
10	55	2-butenal (tent)	53	131	phenol
12	58	C ₆ H ₁₄ isomer	54	132	1,2,4-trimethylbenzene
13	59	perfluorobenzene (ext. std.)	55	135	<i>n</i> -decane
14	60	chloroform	56	138	C ₄ -benzene isomer
15	61	methyl ethyl ketone	57	140	C ₁₁ H ₂₄ isomer
16	63	perfluorotoluene (ext. std.)	58	143	C ₁₁ H ₂₄ isomer
17	65	1,1,1-trichloroethane	59	144	acetophenone
18A	68	benzene	60	147	<i>p</i> -cresol
18B	68	carbon tetrachloride	61	148	C ₁₁ H ₂₄ isomer
18C	68	cyclohexane	62A	150	4-octanol (tent)
19	71	C ₇ H ₁₆ isomer	62B	150	propiophenone (tent)
20	72	C ₇ H ₁₆ isomer	63	151	<i>n</i> -nonanal (tent)
21	73	1,2-dichloropropane	64	153	<i>n</i> -undecane
22A	74	C ₇ H ₁₄ isomer	65	158	dimethylphenol isomer
22B	74	trichloroethylene	66	162	dimethylphenol isomer
23	76	<i>n</i> -heptane	67	164	dimethylphenol isomer
24	77	bis-(chloromethyl)ether (tent)	68A	167	trimethylphenol isomer
25	79	pentanal isomer (tent)	68B	167	naphthalene
26	81	C ₇ H ₁₄ isomer	69	168	dimethylphenol isomer
27A	82	dimethyl disulfide	70	170	<i>n</i> -dodecane
27B	82	methyl isobutyl ketone	71	172	trimethylphenol isomer
28	83	C ₇ H ₁₄ isomer	72	174	hexachloro-1,3-butadiene
29	84	C ₇ H ₁₄ isomer	73	176	m/e 59
30	86	toluene	74	177	m/e 101
31	87	C ₈ H ₁₈ isomer	75	185	C ₁₃ H ₂₆ isomer
32	92	<i>n</i> -hexanal (tent)	76	186	<i>n</i> -tridecane
33	95	acetic acid	77	188	isobutyl isobutyrate (tent)
34	96	<i>n</i> -octane	78	190	ethyl methyl dioxalane (tent)
35	97	tetrachloroethylene	79	192	C ₁₄ H ₃₀ isomer
36	102	chlorobenzene	80	195	2-butyl- <i>n</i> -butyrate (tent)
37	106	ethylbenzene	81	197	<i>n</i> -butyl- <i>n</i> -butyrate (tent)
38	108	<i>p</i> -xylene	82	200	C ₁₄ H ₂₈ isomer
39	110	C ₉ H ₂₀ isomer	83	202	<i>n</i> -tetradecane
40	112	styrene	84	214	C ₁₄ H ₂₈ isomer
41	113	<i>o</i> -xylene	85	216	<i>n</i> -pentadecane
42	114	C ₉ H ₁₈ isomer			
43	116	<i>n</i> -nonane			
44	118	cumene			
45	119	C ₉ H ₁₈ isomer			

^aSampling was at LL3 (Fig. 16), see Table 16.

Table A39. VOLATILE ORGANIC VAPORS IN AMBIENT AIR
FROM FREEPORT, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	27B	84	methylpentanal isomer
2	41	dichlorodifluoromethane	28	85	C ₈ H ₁₆ isomer
2A	43	n-propane	28A	86	C ₈ H ₁₆ isomer + acetic acid
3	43	1-butene	29	86	1,1,2-trichloroethane
3A	44	n-butane	30	88	toluene
3B	44	chloromethane	30A	89	C ₈ H ₁₆ isomer
4	45	acetaldehyde	31	90	C ₈ H ₁₈ isomer
4A	46	dichlorofluoromethane	32	91	dibromochloromethane
5	47	isopentane	32A	92	C ₈ H ₁₆ isomer
6	47	acetone	33	94	n-hexanal
7	48	trichlorofluoromethane	33A	94	C ₈ H ₁₆ isomer
8	49	n-pentane	34	97	n-octane
9	50	butanol isomer (tent.)	35	98	tetrachloroethylene
10	51	dichloromethane	36	99	n-butyl acetate (tent.)
10A	51	ter-butanol	38	104	1,1,1,2-tetrachloroethane
10B	52	C ₆ H ₁₄ isomer	38A	106	C ₉ H ₁₈ isomer
11	55	C ₅ H ₁₀ isomer	39	107	ethylbenzene
12	56	2-methylpentane	40	109	p-xylene
13	58	3-methylpentane	40A	110	bromoform
13A	58	butanal	41	113	styrene
14	59	hexafluorobenzene (eW)	42	114	p-xylene
15	60	n-hexane	42A	115	n-heptanal
16	61	chloroform	42B	116	C ₉ H ₁₈ isomer
17	64	perfluorotoluene (eW)	43	117	n-nonane
18	65	1,2-dichloroethane	44	119	C ₉ H ₁₈ isomer
19	66	1,1,1-trichloroethane	45	120	isopropylbenzene
20	68	benzene	45A	121	C ₁₀ H ₂₂ isomer
21	69	carbon tetrachloride	45B	121	C ₈ H ₁₀ O isomer
21A	70	cyclohexane	45C	122	C ₁₀ H ₂₂ isomer
22	71	2-methylhexane	45D	123	C ₁₀ H ₂₀ isomer
22A	71	2,3-dimethylpentane	45E	124	methylstyrene
23	72	3-methylhexane	46	124	C ₁₁ H ₂₄ + C ₁₀ H ₁₆ isomers
23A	73	dibromomethane + 1,2-dichloro- propane	47	125	benzaldehyde
23B	74	methylbutanal isomer	48	126	n-propylbenzene
24	75	trichloroethylene + C ₇ H ₁₄ isomer	48A	127	C ₁₀ H ₂₀ isomer
24A	75	C ₈ H ₁₈ isomer	49	128	m-ethyltoluene
24B	76	n-pentanal	49A	129	C ₁₀ H ₂₀ isomer
24C	76	C ₇ H ₁₄ isomer	50	130	C ₁₁ H ₂₄ isomer
25	77	n-heptane	50A	131	C ₁₀ H ₁₆ isomer
25A	80	C ₇ H ₁₄ isomer	51	131	phenol
26	81	methylcyclohexane	51A	132	2-octanone
26A	83	C ₈ H ₁₆ isomer	52	133	C ₁₁ H ₂₄ isomer
27	83	C ₈ H ₁₈ isomer	53	134	n-octanal
27A	84	4-methyl-2-pentanone	53A	135	C ₁₀ H ₂₀ isomer
			54	136	dichlorobenzene isomer
			55	137	n-decane

(continued)

Table A39 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
56	138	C ₁₀ H ₂₀ isomer	82	195	2-butyl-n-butyrate
56A	139	1,2,3,-trimethylbenzene	82A	196	C ₁₄ H ₂₈ isomer
56B	140	C ₄ -alkyl benzene isomer	83	197	n-butyl n-butyrate
57	141	C ₁₀ H ₂₀ isomer	84	198	C ₁₄ H ₂₈ isomer
58	142	C ₁₁ H ₂₄ isomer + unknown	85	200	C ₁₂ H ₂₄ O ₃ isomer
59	143	bis-(2-chloroisopropyl)ether or bis-(1-chloro-prop-2-yl)- ether	85A	201	C ₁₄ H ₂₈ isomer
60	144	C ₄ -alkyl benzene isomer	86	202	n-tetradecane
60A	145	C ₁₁ H ₂₄ isomer	86A	202	dimethylnaphthalene isomer
61	146	acetophenone	86B	203	C ₁₄ H ₂₈ isomer
62	148	C ₁₁ H ₂₄ isomer	86C	203	C ₁₅ H ₃₂ isomer
62A	151	nonanone isomer	86D	204	dimethylnaphthalene isomer
63	153	n-nonanal	86E	205	dimethyl phthalate
63A	154	C ₁₁ H ₂₂ isomer	86F	208	C ₁₃ H ₂₆ O isomer
64	155	n-undecane	87	209	C ₁₅ H ₃₀ isomer
65	156	C ₁₁ H ₂₂ isomer	88	210	C ₁₅ H ₃₂ isomer
65A	157	C ₁₂ H ₂₄ isomer	88A	214	C ₁₃ H ₂₆ O isomer
65B	158	C ₄ -alkyl benzene isomer	89	215	C ₁₅ H ₃₀ isomer
66	159	dimethylphenol + C ₁₁ H ₂₂ isomers	90	216	n-pentadecane
67	160	dimethylphenol isomer	91	218	dibenzofuran
67A	161	C ₁₂ H ₂₄ isomer	92	223	C ₁₆ H ₃₄ isomer
67B	162	dimethylphenol isomer	93	224	diethyl phthalate
67C	162	C ₁₁ H ₂₂ isomer	94	226	C ₁₅ H ₃₀ isomer
68	163	ethylphenol + C ₁₀ H ₁₄ O isomers	94A	227	C ₁₄ H ₂₈ O isomer
69	165	C ₁₂ H ₂₄ isomer	95	228	alkyl butyrate (tent.)
70	168	naphthalene + C ₃ -alkyl phenol isomer	96	229	n-hexadecane
71	169	n-decanal	97	232	benzophenone
71A	170	C ₁₂ H ₂₄ isomer	98	236	C ₁₆ H ₃₄ isomer
72	171	n-dodecane	100	240	C ₁₅ H ₃₀ O isomer
72A	173	C ₄ -alkyl benzene isomer	101	240	C ₁₇ H ₃₄ isomer
73	174	1,3-hexachlorobutadiene	102	240	n-heptadecane
74	176	C ₃ -alkyl phenol + unknown	103	240	C ₁₈ H ₃₈ isomer
75	178	C ₁₃ H ₂₈ isomer	104	240	2,6-di-tert-butyl-4-methoxy- phenol (tent.)
75A	179	C ₁₃ H ₂₆ isomer	107	240	unknown
75B	180	C ₁₃ H ₂₆ isomer	108	240	unknown
76	182	C ₁₃ H ₂₈ isomer	110	240	dipropyl phthalate
77	184	C ₁₁ H ₂₂ O isomer	111	240	C ₁₇ H ₃₆ isomer
78	186	β-methylnaphthalene	112	240	C ₁₈ H ₃₈ isomer
79	187	n-tridecane	113	240	C ₁₇ H ₃₄ O isomer
79A	189	α-methylnaphthalene	114	240	n-nonadecane
80	190	alkyl alcohol isomer (tent.)			
80A	191	C ₁₄ H ₃₀ isomer			
81	193	C ₁₄ H ₂₈ isomer			

^aSampling was at FL1 (Fig. 15), see Table 16 for protocol.

Table A40. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM FREEPORT, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	carbon dioxide	43	116	n-nonane
3B	45	acetaldehyde	44	118	cumene
4A	47	C ₅ H ₁₂ isomer	45	119	C ₁₀ H ₂₂ isomer
4B	47	trichlorofluoromethane	46	120	C ₁₀ H ₂₂ isomer
4C	47	propanal	47	122	C ₁₀ H ₁₆ isomer
5	48	diethyl ether	48	123	benzaldehyde
6	49	methylene chloride	49	124	C ₃ -alkyl benzene
7	51	1,1,1,2-tetrachlorodi- fluoroethane	50	126	C ₃ -alkyl benzene
8	54	C ₅ H ₁₀ isomer	51	127	C ₃ -alkyl benzene
9	55	C ₆ H ₁₄ isomer	52	128	C ₁₁ H ₂₄ isomer
10	57	3-methylpentane	53	129	C ₃ -alkyl benzene
11	58	n-hexane	54A	130	C ₁₁ H ₂₄ isomer
12	59	perfluorobenzene (eW)	54B	130	phenol
13	60	chloroform	55	132	C ₃ -alkyl benzene
14	63	perfluorotoluene (eW)	56	133	dichlorobenzene isomer
15	64	1,1,1-trichloroethane	57	134	n-decane
16A	67	benzene	58	135	C ₁₁ H ₂₄ isomer
16B	67	carbon tetrachloride	59	137	C ₁₁ H ₂₄ isomer
17	68	cyclohexane	60	138	acetophenone
18	69	C ₇ H ₁₆ isomer	61	140	C ₁₂ H ₂₆ isomer
19	71	C ₇ H ₁₆ isomer	62	141	bis-(2-chloroisopropyl)ether
20	72	1,2-dichloropropane	63	142	C ₁₁ H ₂₄ isomer
21	73	trichloroethylene	64	142	C ₁₂ H ₂₆ isomer
22	75	n-heptane	65	143	C ₄ -alkyl benzene
23	78	C ₇ H ₁₄ isomer	66	146	C ₁₂ H ₂₆ isomer
24	80	C ₇ H ₁₄ isomer	67	147	C ₄ -alkyl benzene
25	81	C ₈ H ₁₈ isomer	68	147	C ₄ -alkyl benzene
26	83	C ₈ H ₁₈ isomer	69	148	C ₄ -alkyl benzene
27	84	C ₈ H ₁₆ isomer	70	149	C ₄ -alkyl benzene
28	86	toluene	71	150	C ₁₂ H ₂₆ isomer
29	87	C ₈ H ₁₈ isomer	72	153	n-undecane
30	89	C ₈ H ₁₆ isomer	73	154	C ₄ -alkyl benzene
31	92	C ₈ H ₁₆ isomer	74	158	dimethyl phenol isomer
32	95	n-octane	75	162	dimethyl phenol isomer
33	95	tetrachloroethylene	76	165	C ₁₂ H ₂₆ isomer
34	99	4,4-dichlorohexafluoro-1- butene (tent.)	77	165	naphthalene
35	102	chlorobenzene	78A	168	C ₁₂ H ₂₂ isomer
36	103	1,2-dibromopropane	78B	168	2- <i>t</i> -butylcyclohexanol (tent.)
37	104	C ₉ H ₂₀ isomer	79	170	n-dodecane
38	105	ethylbenzene	80	172	hexachloro-1,3-butadiene
39	107	p-xylene	81	175	tripropylenglycol (tent.)
40	110	C ₉ H ₂₀ isomer	82	176	diisobutoxy ethane (tent.)
41	111	styrene	83	178	C ₁₃ H ₂₈ isomer
42	112	o-xylene	84	180	C ₁₃ H ₂₈ isomer
			85	182	C ₁₃ H ₂₈ isomer
			86	184	methylnaphthalene isomer

(continued)

Table A40 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
87	185	n-tridecane			
88	188	m/e 87			
89	191	C ₁₄ H ₃₀ isomer			
90A	194	tetrachloropropene isomer			
90B	194	2-butyl-n-butyrate (tent.)			
91	195	C ₁₄ H ₃₀ isomer			
92	196	n-butyl-n-butyrate (tent.)			
93	199	C ₁₄ H ₂₈ isomer			
94	200	C ₁₄ H ₃₀ isomer			
95	213	C ₁₅ H ₃₀ isomer			
96	215	C ₁₅ H ₃₂ isomer			

^aSampling was at FL2 (Fig 15), see Table 16.

Table A41. VOLATILE ORGANIC VAPORS IN AMBIENT AIR
FROM FREEPORT, TX^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	methyl ether	43	116	cumene
2	41	difluorodichloromethane	44	118	C ₁₁ H ₂₄ isomer
3	42	methyl chloride	45	120	C ₁₀ H ₂₂ isomer
4	43	m/e 62 (?)	46	122	benzaldehyde
5	44	chloroethane	46A	122	n-propylbenzene
6	45	acetaldehyde	47	124	C ₃ benzene isomer
7	46	2-butene	48	126	pentachloroethane
8	46	trichlorofluoromethane	49	216	C ₁₀ H ₂₂ isomer
9	47	isopentane	50	217	C ₃ benzene isomer
10	48	vinylidene chloride	51	128	phenol
11	49	methylene chloride	52	130	C ₃ benzene isomer
12	50	Freon 113 (Rkd.)	53	132	n-decane
13	51	acetone	53A	132	m-dichlorobenzene
14	53	phosgene	54	136	C ₃ benzene isomer
15	56	3-methyl pentane	55	138	m/e 37
16	57	perfluorobenzene (ext. std.)	56	139	bis(2-chloroisopropyl)ether
17	58	chloroform	57	140	C ₄ benzene isomer
18	60	C ₇ H ₁₆ isomer	58	142	C ₄ benzene isomer
19	61	perfluorotoluene (ext. std.)	58A	142	acetophenone
20	62	1,1,1-trichloroethane	59	144	C ₄ benzene isomer
21	62	1,2-dichloroethane	59A	144	m-cresol
22	63	methyl ethyl ketone	60	145	perchloroethane
23	65	carbon tetrachloride	61	147	C ₄ benzene isomer
24	65	benzene	62	149	m/e 37
25	68	C ₇ H ₁₆ isomer	63	151	C ₁₁ H ₂₄ isomer
26	69	1,2-dichloropropane	64	153	C ₄ benzene isomer
27	70	trichloroethylene	65	154	C ₄ benzene isomer
28	73	p-dioxane	66	156	dimethyl phenol isomer
29	76	C ₇ H ₁₄ isomer	66A	156	C ₁₀ H ₁₈ isomer
30	78	n-heptane	67	160	dimethyl phenol isomer
30A	78	ethylene glycol dimethyl ether	68	163	C ₁₂ H ₂₆ isomer
31	82	1,1,2-trichloroethane	69	164	naphthalene
32	84	toluene	70	166	C ₁₀ H ₁₆ isomer
33	89	1,2-dibromoethane	71	168	C ₁₂ H ₂₆ isomer
34	92	n-octane	72	169	C ₁₂ H ₂₆ isomer
34A	92	tetrachloroethylene	73	171	hexachloro-1,3-butadiene
35	97	C ₉ H ₂₀ isomer	74	173	tripropylene glycol (tent)
36	99	1,1,1,2-tetrachloroethane	75	175	dibutoxyethane (tent)
37	103	ethylbenzene	76	177	C ₁₃ H ₂₈ isomer
38	105	p-xylene	77	181	C ₁₃ H ₂₈ isomer
39	109	styrene	78	182	beta-methylnaphthalene
40	110	1,1,2,2-tetrachloroethane	79	184	C ₁₃ H ₃₂ isomer
40A	110	p-xylene	80	185	alpha-methylnaphthalene
40B	110	1,2,3-trichloropropane	81	187	m/e 87
41	113	n-nonane	82	188	C ₁₂ H ₂₄ isomer
42	114	C ₁₀ H ₂₂ isomer	83	190	C ₁₄ H ₃₀ isomer

(continued)

Table A41 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
84	192	2-butyl n-butyrate (tent)			
85	194	n-butyl n-butyrate (tent)			
86	198	diphenyl ether			
87	199	n-tetradecane			
88-100	200-240	Column Background			

^aSampling was at FL3 (Fig. 15), see Table 16.



Table A42. VOLATILE ORGANIC VAPORS IN AMBIENT AIR IN GEISMAR, LA
AT LOCATION #14^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	CO ₂	23C	102	C ₉ H ₂₀ isomer
1A	43	propane (tent.)	23D	103	n-hexanal (tent.)
1B	44	butene isomer	23E	104	C ₉ H ₂₀ isomer
1C	44	n-butane	23F	105	C ₈ H ₁₆ isomer
2	48	isopentane	24	105	C ₉ H ₂₀ isomer
2A	49	C ₅ H ₁₀ isomer (tent.)	24A	106	C ₉ H ₁₈ isomer
2B	49	n-pentane	24B	108	C ₉ H ₁₈ isomer
2C	51	acetaldehyde	25	109	ethylbenzene
3	52	dichloromethane	25A	110	C ₉ H ₂₀ isomer
3A	53	propanal	26	110	p-xylene
3B	53	propenal	27	112	C ₉ H ₂₀ isomer
4	54	dimethyl ether + diethyl ether	27A	113	C ₉ H ₂₀ isomer
4A	54	acetone	28	115	o-xylene + styrene or cyclo- octatetraene
5	55	2-methylpentane	28A	116	C ₉ H ₁₈ isomer
6	57	3-methylpentane	29	117	n-nonane
7	59	hexafluorobenzene (eE)	29A	119	C ₉ H ₁₈ isomer
8	60	n-hexane	30	121	C ₁₀ H ₂₀ isomer
9	61	chloroform	31	124	propylcyclohexane
10	63	perfluorotoluene (eE)	31A	127	n-propylbenzene
10A	64	methylcyclopentane	32	128	ethyltoluene isomer
10B	65	n-butanal (tent.)	33	130	C ₁₀ H ₂₂ isomer
10C	66	1,1,1-trichloroethane	33A	132	C ₃ -alkyl benzene isomer
10D	67	1,2-dichloroethane	34	132	C ₁₀ H ₂₀ isomer
11	69	benzene + carbon tetrachloride	34A	134	C ₁₀ H ₂₀ isomer + benzaldehyde
11A	70	cyclohexane	35	135	C ₃ -alkyl benzene isomer
12	71	2-methylhexane	36	136	n-decane
12A	71	2,3-dimethylpentane	36A	139	C ₄ -alkyl benzene isomer
13	73	3-methylhexane	37	140	1,2,3-trimethylbenzene
14	75	C ₇ H ₁₄ isomer	37A	141	phenol (tent.)
14A	76	methyl ethyl ketone	38	142	C ₁₁ H ₂₄ isomer
15	77	n-heptane	39	143	C ₄ -alkyl cyclohexane isomer
15A	78	trichloroethylene (tent.)	40	144	C ₁₁ H ₂₄ + C ₄ -alkyl benzene isomers
16	80	n-pentanal	40A	145	C ₄ -alkyl benzene isomer
17	82	methylcyclohexane	41	146	C ₄ -alkyl benzene isomer
18	84	C ₈ H ₁₈ isomer	41A	147	C ₁₁ H ₂₄ isomer
18A	86	C ₈ H ₁₆ isomer	42	148	C ₄ -alkyl benzene isomer
18B	87	C ₈ H ₁₆ isomer	43	149	C ₁₁ H ₂₄ isomer
19	89	toluene	43A	150	C ₄ -alkyl benzene isomer
20	90	C ₈ H ₁₈ isomer	44	151	acetophenone
21	92	C ₈ H ₁₈ isomer	44A	152	C ₁₁ H ₂₂ isomer
22	93	dimethylcyclohexane isomer	45	153	n-nonanal
22A	94	C ₈ H ₁₈ isomer	46	153	n-undecane
22B	95	C ₈ H ₁₆ isomer	47	157	C ₄ -alkyl benzene isomer
23	97	n-octane	47A	158	cresol isomer
23A	99	C ₈ H ₁₆ isomer			
23B	99	tetrachloroethylene			

(continued)

Table A42 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
48	160	C ₅ -alkyl benzene + C ₁₁ H ₂₂ isomers			
48A	161	C ₅ -alkyl benzene isomer			
48B	162	C ₆ -alkyl benzene isomer			
49	163	C ₂ -alkyl phenol isomer			
50	164	C ₁₂ H ₂₆ isomer (tent.)			
51	165	C ₂ -alkyl phenol isomer (tent.)			
51A	167	naphthalene			
51B	168	C ₁₂ H ₂₄ isomer			
52	169	n-decanal			
53	170	n-dodecane			
54	172	C ₁₃ H ₂₈ isomer			
54A	175	C ₁₃ H ₂₆ isomer			
54B	176	C ₆ -alkyl cyclohexane or C ₁₂ H ₂₄ isomer			
55	178	C ₁₃ H ₂₈ isomer (tent.)			
56	179	C ₁₃ H ₂₆ isomer			
57	181	C ₁₃ H ₂₈ isomer			
57A	184	C ₁₃ H ₂₆ isomer			
58	185	n-tridecane			
58A	185	methylnaphthalene isomer			
59	187	C ₁₃ H ₂₆ isomer (tent.)			
61	192	C ₂ -alkyl cyclohexane isomer			
62	193	isobutyl isobutanoate			
63	195	butyl butanoate			
64	196	C ₁₄ H ₃₀ isomer			
64A	197	C ₁₄ H ₂₈ isomer			
65	198	n-tetradecane			
66	200	C ₂ -alkyl naphthalene isomer			
66A	201	C ₂ -alkyl naphthalene isomer			
66B	203	C ₁₅ H ₃₀ isomer			
67	205	C ₁₄ H ₂₈ isomer			
68	207	C ₁₅ H ₃₂ isomer			
70	212	n-pentadecane			
72	219	C ₁₅ H ₃₀ isomer			
73	221	diethyl phthalate (BKG)			
74	223	2,2,4-trimethyl penta-1,3-diol di-isobutyrate (BKG)			
75	224	n-hexadecane			
76	230	C ₁₇ H ₃₆ isomer			
77	232	C ₁₆ H ₃₂ isomer			
78	235	alkyl ketone isomer (tent.)			
79	236	n-heptadecane			
80	238	saturated hydrocarbon isomer			
83	240	unknown			

^a See Table 17 for sampling protocol.

Table A43. VOLATILE ORGANICS IN AMBIENT AIR FROM GEISMAR, LA
AT LOCATION #14^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	CO ₂	26	104	C ₉ H ₂₀ isomer (tent.)
1A	44	propane (tent.)	27	105	C ₉ H ₂₀ isomer
1B	45	1-butene	28	106	ethylcyclohexane
1C	46	n-butane	28A	106	C ₉ H ₂₀ isomer
1D	49	chloroethane	28B	107	C ₉ H ₁₈ isomer
2	50	isopentane	28C	107	C ₇ H ₁₆ O alcohol isomer (tent.)
2A	52	C ₅ H ₁₀ isomer	29	108	chlorobenzene
3	52	n-pentane	29A	109	C ₉ H ₁₈ isomer
3A	53	furan	30	110	ethylbenzene
3B	54	dichloroethylene isomer + C ₅ H ₁₀ isomer + dimethyl ether	30A	111	C ₉ H ₂₀ isomer
4	55	acetaldehyde	31	112	p-xylene
4A	56	dichloromethane	32	113	C ₉ H ₂₀ isomer
4B	58	propanal	33	114	phenylacetylene + C ₉ H ₁₈ isomer
4C	58	propenal (tent.)	33A	115	2-heptanone
4D	59	dichloroethylene + C ₅ H ₁₀ isomers	34	116	o-xylene + styrene
5	59	2-methylpentane	34A	117	C ₉ H ₁₈ isomer
5A	60	1,1-dichloroethane	35	118	n-nonane
6	61	acetone + 3-methylpentane	36	120	C ₉ H ₁₈ isomer
7	62	hexafluorobenzene (e#)	36A	122	isopropylbenzene
7A	63	n-hexane	37	122	cyclohexanone or methylcyclo- pentanone isomer
8	65	chloroform	37A	124	C ₉ H ₁₈ isomer
9	67	perfluorotoluene (e#)	38	125	C ₁₀ H ₂₂ isomer
10	68	1,2-dichloroethane	38A	128	n-propylbenzene
10A	69	1,1,1-trichloroethane (tent.)	39	129	ethyltoluene isomer
11	72	benzene + carbon tetrachloride	40	130	C ₁₁ H ₂₄ isomer
11A	73	cyclohexane	40A	131	1,3,5-trimethylbenzene
12	74	2-methylhexane	41	132	C ₁₀ H ₂₂ isomer
12A	74	2,3-dimethylpentane	41A	132	o-ethyltoluene
13	75	3-methylhexane	41B	134	C ₁₀ H ₂₂ isomer
14	78	dimethylcyclopentane	41C	134	benzaldehyde + C ₁₀ H ₂₀ isomer
15	80	n-heptane	42	135	1,2,4-trimethylbenzene
16	84	methylcyclohexane	43	137	n-decane
17	86	C ₈ H ₁₈ isomer	43A	138	phenol
18	90	C ₈ H ₁₈ isomer	43B	139	dichlorobenzene isomer (tent.)
19	91	1,1,2-trichloroethane	43C	140	C ₄ -alkyl benzene isomer
20	92	toluene	44	140	1,2,3-trimethylbenzene
21	93	C ₈ H ₁₈ isomer	44A	141	C ₁₁ H ₂₄ isomer
22	94	C ₈ H ₁₈ isomer	44B	142	indan (tent.)
22A	95	C ₈ H ₁₆ isomer	45	143	C ₄ -alkyl cyclohexane isomer
22B	96	3-hexanone	45A	143	dichlorobenzene isomer (tent.)
23	98	2-hexanone	46	144	C ₁₁ H ₂₄ isomer
24	99	n-octane	46A	144	C ₄ -alkyl benzene isomer
24A	100	C ₈ H ₁₆ isomer	47	145	C ₄ -alkyl benzene isomer
25	101	tetrachloroethylene	47A	146	C ₁₁ H ₂₂ isomer

(continued)

Table A43 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
48	147	C ₁₁ H ₂₄ + C ₄ -alkyl benzene isomers	72	204	C ₈ -alkyl cyclohexane isomer
49	148	C ₁₁ H ₂₄ isomer	73	206	C ₁₅ H ₃₂ isomer
49A	149	C ₄ -alkyl benzene isomer	74	209	C ₁₅ H ₃₀ isomer
50	150	acetophenone + C ₄ -alkyl benzene isomer	75	211	n-pentadecane
50A	151	C ₁₁ H ₂₂ isomer	76	213	C ₁₅ H ₃₀ isomer
50B	152	C ₁₁ H ₂₂ isomer	78	218	C ₉ -alkyl cyclohexane isomer
51	153	n-undecane	79	220	diethyl phthalate (BKG)
51A	154	C ₅ -alkyl benzene isomer	79A	221	C ₁₆ H ₃₂ isomer
52	156	C ₄ -alkyl benzene isomer	81	223	n-hexadecane
52A	157	cresol isomer	82	226	C ₁₆ H ₃₂ isomer
52B	158	C ₁₂ H ₂₆ isomer	83	230	C ₁₇ H ₃₆ isomer
52C	159	C ₅ -alkyl benzene isomer	84	231	C ₁₀ -alkyl cyclohexane isomer
53	159	C ₅ -alkyl cyclohexane isomer	86	235	n-heptadecane
54	162	C ₂ -alkyl phenol + C ₅ -alkyl benzene isomer	87	237	C ₁₈ H ₃₈ isomer
54A	162	C ₁₂ H ₂₆ isomer			C ₁₁ -alkyl cyclohexane isomer
55	164	C ₁₂ H ₂₆ isomer	88	240	C ₁₈ H ₃₈ isomer
56	166	naphthalene	89	240	C ₁₈ H ₃₈ isomer
56A	167	C ₁₂ H ₂₄ isomer	90	240	alkyl phthalate (?)
56B	167	C ₁₂ H ₂₂ isomer	91	240	C ₁₉ H ₄₀ isomer
56C	168	C ₁₂ H ₂₄ + C ₅ -alkyl benzene isomers	91A	240	alkyl phthalate (?)
57	169	n-dodecane			
58	171	C ₁₂ H ₂₄ isomer			
59	173	C ₁₃ H ₂₈ isomer (tent.)			
59A	174	C ₁₃ H ₂₆ isomer			
60	175	C ₆ -alkyl cyclohexane isomer			
60A	179	C ₁₃ H ₂₆ isomer			
61	180	C ₁₄ H ₃₀ isomer			
61A	181	C ₁₃ H ₂₆ isomer			
62	184	n-tridecane			
62A	185	methylnaphthalene isomer			
63	186	C ₁₃ H ₁₈ isomer			
63A	187	C ₁₄ H ₂₈ isomer			
65	189	C ₁₀ H ₁₈ isomer (tent.)			
66	191	C ₇ -alkyl cyclohexane isomer			
67	192	isobutyl isobutyrate			
68	194	butyl butanoate			
69	195	C ₁₄ H ₃₀ isomer			
69A	196	C ₁₄ H ₂₈ isomer			
69B	196	biphenyl ether			
70	197	n-tetradecane			
70A	198	C ₁₄ H ₂₈ isomer			
71A	203	C ₁₅ H ₃₀ isomer			

^a See Table 17 for sampling protocol.

Table A44. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM GEISMAR, LA
AT LOCATION #15^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	40	CO ₂	28	111	phenylacetylene
3	44	1-butene + n-butane	28A	113	C ₉ H ₁₈ isomer
4	48	isopentane	29	115	C ₉ H ₂₀ isomer + o-xylene
4A	48	C ₅ H ₁₀ isomer	30	117	n-nonane
5	49	n-pentane	31	119	C ₉ H ₁₈ isomer
5A	50	uran	32	121	isopropylbenzene
5B	51	acetaldehyde	32A	122	C ₁₀ H ₂₂ isomer
6	51	dichloromethane	33	124	C ₈ H ₁₈ O alcohol (tent.)
6A	51	diethyl ether	33A	126	n-propylbenzene
6B	52	dimethyl ether + carbon disulfide	33B	127	C ₁₀ H ₂₀ isomer
7	53	acetone	34	128	ethyltoluene isomer
8	56	2-methylpentene	35	130	C ₁₁ H ₂₄ isomer
8A	57	isopropanol	35A	131	C ₁₀ H ₂₂ isomer
9	58	C ₄ H ₈ O isomer + 3-methylpentane	36	132	benzaldehyde
9A	58	ter-butanol	37	134	1,2,4-trimethylbenzene
10	59	hexafluorobenzene (eB)	37A	135	C ₁₀ H ₂₀ isomer
10A	60	n-hexane	38	136	n-decane
11	61	chloroform	38A	137	dichlorobenzene isomer
12	64	perfluorotoluene (eB)	39	139	1,2,3-trimethylbenzene
13	65	1,2-dichloroethane	40	142	o-dichlorobenzene
14	69	benzene	41	143	C ₁₁ H ₂₄ isomer
14A	69	carbon tetrachloride	41A	144	C ₄ -alkyl benzene isomer
14B	70	cyclohexane	41B	145	C ₁₁ H ₂₂ isomer
15	71	C ₇ H ₁₆ isomer	42	145	C ₄ -alkyl benzene isomer
16	73	3-methylhexane	43	147	C ₁₁ H ₂₄ isomer
17	75	C ₇ H ₁₄ isomer	43A	149	C ₄ -alkyl benzene isomer
17A	76	trichloroethylene	44	150	acetophenone
18	77	n-heptane	44A	152	C ₁₁ H ₂₂ isomer
19	81	methylcyclohexane	45	153	n-nonanal
19A	83	C ₈ H ₁₈ isomer	46	154	n-undecane
19B	86	C ₈ H ₁₆ isomer (tent.)	46A	155	cresol isomer
20	88	1,1,2-trichloroethane	47	156	C ₁₁ H ₂₂ isomer
21	89	toluene	47A	156	C ₄ -alkyl benzene isomer
21A	92	C ₈ H ₁₈ isomer	47B	157	C ₁₂ H ₂₆ isomer
21B	93	C ₈ H ₁₆ isomer	48	159	C ₅ -alkyl benzene + C ₅ -alkyl cyclohexane isomers
21C	94	C ₈ H ₁₈ isomer	48A	161	C ₂ -alkyl phenol isomer
22	96	2-methyl-3-pentanol (tent.)	49	162	C ₁₂ H ₂₄ isomer
22A	96	C ₈ H ₁₆ isomer	50	163	C ₁₁ H ₂₂ isomer
23	97	n-octane	50A	164	C ₅ -alkyl benzene + C ₂ -alkyl phenol isomers
24	98	tetrachloroethylene	50B	166	C ₂ -alkyl phenol isomer
25	105	dimethyl-3-pentanol isomer	51	167	naphthalene
25A	106	chlorobenzene	51A	168	C ₁₂ H ₂₄ isomer
25B	108	C ₉ H ₂₀ isomer	52	169	n-decanal
26	109	ethylbenzene	53	170	n-dodecane
27	110	p-xylene			

(continued)

Table A44 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
53A	171	C ₁₂ H ₂₄ isomer			
53B	172	C ₁₂ H ₂₄ isomer			
54	173	C ₁₃ H ₂₈ isomer			
55	175	C ₆ -alkyl cyclohexane isomer			
55A	177	alkyl alcohol isomer			
56	178	C ₁₃ H ₂₈ isomer			
57	181	C ₁₄ H ₃₀ isomer			
57A	183	8-methylnaphthalene			
58	184	n-tridecane			
58A	185	C ₁₃ H ₂₆ isomer			
58B	186	o-methylnaphthalene			
60	190	C ₁₄ H ₃₀ isomer (tent.)			
61	193	isobutyl isobutyrate			
62	194	butyl butyrate			
63	195	C ₁₄ H ₃₀ isomer			
63A	197	C ₁₄ H ₂₈ isomer			
64	198	biphenyl ether			
64A	199	n-tetradecane			
65	200	C ₁₄ H ₂₈ isomer			
65A	201	C ₂ -alkyl naphthalene isomer			
66	203	C ₁₅ H ₃₀ isomer			
67	205	C ₆ -alkyl cyclohexane isomer			
68	207	C ₁₅ H ₃₂ isomer			
69	209	C ₁₅ H ₃₀ isomer			
70	211	n-pentadecane			
70A	211	C ₁₅ H ₂₄ O isomer			
70B	212	C ₁₅ H ₃₀ isomer			
72	217	2,5-diisobutylthiophene (tent.)			
73	219	C ₉ -alkyl cyclohexane isomer			
74	220	diethyl phthalate (BKG)			
74A	222	C ₁₆ H ₃₂ isomer			
76	224	n-hexadecane			
76A	226	C ₁₆ H ₃₂ isomer			
77	230	C ₁₇ H ₃₆ isomer			
78	232	C ₁₆ H ₃₂ isomer			
79	234	alkyl ketone isomer (tent.)			
80	236	n-heptadecane			
80A	236	C ₁₇ H ₃₄ isomer			
81	237	C ₁₈ H ₃₈ isomer			
82	240	C ₁₈ H ₃₈ isomer			
83	240	C ₁₈ H ₃₈ isomer			
83A	240	alkyl phthalate isomer (BKG)			
84	240	C ₁₉ H ₄₀ isomer (tent.)			
86	240	alkyl phthalate isomer (BKG)			

^a See Table 17 for sampling protocol.

Table A45. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM GEISMAR, LA
AT LOCATION #16^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	CO ₂	24A	121	C ₁₀ H ₂₂ isomer (tent)
1A	44	butene	24B	122	C ₉ H ₁₈ isomer
1B	45	1-buten-3-yne	24C	127	C ₃ -alkyl benzene isomer
2	46	1,3-butadiyne	25	129	C ₁₀ H ₂₂ isomer
3	49	dimethyl ether	25A	133	C ₃ -alkyl benzene isomer
5A	51	dichloromethane	25B	134	benzaldehyde
5B	52	propenylacetylene or C ₅ H ₆ isomer	26	135	C ₁₀ H ₂₂ isomer
5C	53	propanal + propenal		137	C ₁₀ H ₂₀ isomer
5D	54	acetone	27	140	saturated hydrocarbon
6	55	2-methylpentane	28	143	indene or methylphenyl- acetylene
7	56	vinyl acetate	29	145	phenol + C ₁₁ H ₂₄ isomer
7A	57	3-methylpentane (tent)		150	acetophenone
8	58	hexafluorobenzene (eW)	30	152	n-undecane
8A	59	n-hexane		157	cresol isomer
9	60	chloroform		159	cresol isomer
10	63	perfluorotoluene (eW)	31	161	C ₂ -alkyl phenol isomer + unsaturated hydrocarbon
10A	63	methylcyclopentane	32	166	naphthalene
11	65	1,1,1-trichloroethane	33	168	n-dodecane
11A	66	1,2-dichloroethane	34	171	unsaturated hydrocarbon
12	67	benzene	36	183	n-tridecane
12A	68	carbon tetrachloride		183	8-methylnaphthalene
12B	70	C ₇ H ₁₆ isomer		185	α-methylnaphthalene (tent)
12C	71	C ₇ H ₁₆ isomer	37	186	C ₆ H ₁₄ O alcohol (tent)
13	74	1,2-dichloropropane	40	197	n-tetradecane
14	76	n-heptane	41	204	biphenylene
14A	78	C ₈ H ₁₈ isomer (tent)		205	sat. hydrocarbon (tent)
14B	79	2-pentanone (tent)	42	210	n-pentadecane
14C	80	propionic acid (tent)	43A	223	n-hexadecane
15	81	methylcyclohexane	46	223	C ₁₅ H ₃₀ O isomer (tent)
15A	83	C ₈ H ₁₈ isomer (tent)	47	235	n-heptadecane
16	88	toluene	48	240	n-octadecane
16A	90	C ₈ H ₁₈ isomer			
16B	91	C ₈ H ₁₂ O isomer			
16C	92	C ₈ H ₁₆ isomer			
16D	94	C ₈ H ₁₂ O isomer			
17	96	n-octane			
18	98	tetrachloroethylene			
19	105	chlorobenzene			
19A	108	ethylbenzene			
20	109	xylene isomer			
21	110	phenylacetylene			
22	114	styrene or C ₈ H ₈ isomer			
22A	115	o-xylene			
23	117	n-nonane			
24	120	C ₁₀ H ₂₂ isomer (tent)			

^a See Table 17 for sampling protocol.

Table A46. VOLATILE ORGANIC VAPORS IN AMBIENT AIR FROM GEISMAR, LA^a

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
1	41	CO ₂	21A	126	C ₉ H ₁₈ isomer (tent)
2	42	propane	22	128	n-propylbenzene
2A	44	butene + n-butane	23	129	ethyltoluene
2B	48	isopentane (tent)	24	130	1,3,5-trimethylbenzene +
2C	49	n-pentane			C ₁₁ H ₂₄ isomer
2D	50	acetaldehyde	25	132	benzaldehyde
3A	52	dichloromethane	25A	132	o-ethyltoluene
3B	54	propanal	26	133	1,2,4-trimethylbenzene
3C	55	propenal	27	135	n-decane
3D	56	2-methylpentane	28	136	m or p-dichlorobenzene
3E	58	dimethyl ether	28A	137	phenol
3F	59	acetone	29	138	1,2,3-trimethylbenzene
4	60	3-methylpentane (tent)	30	140	o-dichlorobenzene
5	62	hexafluorobenzene (eW)	31	142	C ₁₁ H ₂₄ isomer
5A	63	n-hexane	31A	143	C ₄ -alkyl benzene
5B	64	C ₄ H ₁₀ O isomer (tent)	31B	144	C ₄ -alkyl benzene
6	64	chloroform	32	146	unsat. hydrocarbon (tent)
7	67	perfluorotoluene (eW)	33	148	acetophenone
7A	70	C ₇ H ₁₆ isomer (tent)	34	149	nitrobenzene
7B	71	1,2-dichloroethane (tent)	35	152	n-undecane
8	71	benzene	36	154	C ₄ -alkyl benzene + C ₁₁ H ₂₂
8A	72	carbon tetrachloride			isomers
8B	72	cyclohexane (tent)	36A	155	C ₁₂ H ₂₆ isomer
9	73	2-methylhexane	36B	156	cresol (tent)
9A	75	3-methylhexane	37	158	C ₃ -alkyl benzene isomer
10	76	1,2-dichloropropane	38	161	C ₃ -alkyl benzene isomer
11	79	n-heptane	39	163	C ₂ -alkyl phenol + hydrocarbon
11A	84	methylcyclohexane			isomers
11B	85	C ₈ H ₁₈ isomer	40	166	naphthalene
11C	89	C ₈ H ₁₈ isomer	41	167	n-dodecane
11D	90	aldehyde (tent)	42	170	C ₁₃ H ₂₈ isomer (tent)
12	91	toluene	42A	171	C ₁₂ H ₂₄ isomer
13	94	C ₈ H ₁₈ isomer	43	177	benzothiazole (tent)
13A	95	C ₈ H ₁₈ isomer	44	178	C ₁₃ H ₂₈ isomer
13B	96	C ₈ H ₁₆ isomer (tent)	44A	181	C ₁₃ H ₂₆ isomer
14	99	n-octane	45	182	n-tridecane
14A	104	C ₆ H ₁₂ O ketone + C ₉ H ₂₀ isomers	45A	183	β-methylnaphthalene
15	106	chlorobenzene	46	185	o-methylnaphthalene + C ₁₃ H ₂₆
15A	109	ethylbenzene			isomer
16	111	xylene isomer	47A	190	C ₁₄ H ₃₀ isomer
17	112	C ₉ H ₂₀ isomer (tent)	50	193	C ₁₄ H ₃₀ isomer
18	115	o-xylene	50A	195	C ₁₄ H ₂₈ isomer
18A	116	C ₉ H ₁₈ isomer	51	196	n-tetradecane
19	117	n-nonane	52	198	C ₂ -alkyl naphthalene isomer
20	121	C ₁₀ H ₂₂ isomer (tent)	52A	200	dimethylnaphthalene isomer
21	124	C ₁₀ H ₂₂ isomer	53	201	dinitrobenzene isomer

(continued)

Table A46 (cont'd)

Chromato- graphic Peak No.	Elution Temp. (°C)	Compound	Chromato- graphic Peak No.	Elution Temp. (°C)	Compound
54	203	C ₈ -alkyl cyclohexane or C ₁₄ H ₂₈ isomer	62	221	n-hexadecane
55	204	C ₁₅ H ₃₂ isomer	62A	223	diphenylamine (tent)
56	205	C ₁₅ H ₃₀ isomer	63	227	C ₁₇ H ₃₆ isomer
57	208	n-pentadecane	64	230	C ₁₆ H ₃₂ isomer
57A	210	C ₃ -alkyl naphthalene isomer	65	232	C ₁₇ H ₃₄ isomer (tent)
58	212	2,4-dinitrotoluene	66	233	n-heptadecane
58A	214	C ₁₆ H ₃₄ isomer (tent)	67	234	C ₁₉ H ₄₀ isomer
59	216	C ₁₅ H ₃₀ isomer	68	239	C ₁₈ H ₃₆ isomer
59A	217	C ₁₆ H ₃₄ isomer	69	240	n-octadecane
60	218	diethyl phthalate (BKG)	70	240	sat. hydrocarbon

^a Sample taken downwind of Rubicon Chemicals, Inc.